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STAKEHOLDER INVOLVEMENT IN PROMOTING SUSTAINABLE FARMING PRACTICES IN CHEREPONI, IN THE NORTH-EAST REGION OF GHANA.

BY

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THIS THESIS IS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PHILOSOPHY (MPHIL) DEGREE IN SUSTAINABILITY SCIENCE

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DECLARATION

I, Abdulai Jamang Jamal-deen, hereby declare that this work is the result of my own research towards the award of Master of Philosophy in Sustainability Science. With the exception of quotations and references, which have all been acknowledged, no part of the work has been submitted for the award of any other degree at the University of Ghana or elsewhere.

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DEDICATION

This work is dedicated to my father, Jamang Abdulai Mohammed and my mother Nana Memuna for their support in my academic pursuit.

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ABSTRACT

Sustainable farming practices involve methods and techniques that prioritize environmental protection, economic viability, and social equity. To promote and implement sustainable farming practices, it is essential to involve stakeholders who have a vested interest in the farming community. This study examined how stakeholders' involvement promote sustainable farming practices in Chereponi (10.138012598017568, 0.29017181227194494). The study sought to investigate the level of stakeholder knowledge and perceptions about sustainable farming practices, farmers' reasons for adopting sustainable farming practices and the barriers that hindered their adoption of sustainable farming practices. The theory of planned behaviour and the conceptualized model of Dessart were employed as the theoretical frameworks underpinning the study. The mixed method research design was used in this study. The main instrument used for quantitative data collection was structured questionnaire. A sample size of 155 using Slovin's sample size formula was chosen for the quantitative data. Qualitative data was collected through focus group discussions. The results revealed that stakeholders have relatively high level of knowledge and positive perception of sustainable farming practices. Majority of the respondents in the survey agreed that sustainable farming practices increase crop yields, farm incomes, and farmers' reputation in the community. Other stakeholders such as NGOs and agricultural extension officers also shared similar sentiments. The study also showed that farmers adopted sustainable farming practices based on personal choices, advice from other farmers, and advice from NGOs and extension officers. However, obstacles such as perceived risks of crop failure, costs, and technical difficulties as well as lack of government support, hindered adoption.

The study concluded that stakeholder involvement is crucial for promoting sustainable farming practices in Chereponi.

Positive perception and collaboration between stakeholders, especially government and NGOs, can ensure successful implementation of sustainable farming practices. The study recommended that the Ministry of Food and Agriculture implements policies that provide support for farmers through subsidized equipment and farm inputs. This can increase the number of farmers adopting sustainable farming practices. Additionally, policies encouraging banks to offer loans with favourable payment structures should be considered.

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CHAPTER ONE
INTRODUCTION

1.0 Background of the Study

In many regions of the world, there is a rising interest in sustainable farming to meet the food demands of the surging human population, while guaranteeing the sustainability of agricultural operations (Beddington, 2011; Pawlak & Kołodziejczak, 2020; Tilman & Clark, 2015). Sustainable agriculture has been highlighted as a crucial avenue for decreasing poverty (Florini & Pauli, 2018), guaranteeing food security (Gil et al., 2019), and promoting environmental sustainability in sub-Saharan Africa (SSA) (Holden, 2018), where agriculture is a major economic activity (Ayantunde et al., 2018). Stakeholder involvement has been proven to be beneficial in enlisting and empowering farmers to indulge in sustainable agricultural practices (Avea et al., 2016).

Historical estimates of the International Labour Organisation (ILO) department of the World Bank shows that the agriculture industry in sub-Saharan Africa (SSA) employs over 50 percent of the working population and contributes approximately 14 percent of the regions total Gross Domestic Product (GDP) (Chauvin et al., 2012). In contrast to this, the agricultural sector of developed nations, for example that of the European Union (EU), only hires close to 4 percent of the regions workforce, which translates into a 1.6 percent input to GDP (Timmer et al., 2011). According to Bjornlund et al. (2020), large expanse of family-owned lands dominated by small-scale farming in SSA is the main cause of this discrepancy. In Ghana for example, over 85 percent of farmers practice small-scale farming (Ehiakpor et al., 2021). Family farming, which produces between 75 and 80 percent of the world's food, is a primary driver of sustainable development in many countries, according to reports from the Food and Agricultural Organisation (FAO) (Brady & Pierri, 2019). In sub-Saharan Africa (SSA), although there is a

high level of engagement in agricultural activities, it does not necessarily translate to a significant increase in food production and supply for the population of a particular country (De Graaf et al., 2011). In 2017, for instance, Somaliland, Kenya, Ethiopia and South Sudan declared that over 6 million of their population was in urgent need of food (Scribner, 2017).

According to the United Nation's (UN's) Committee on World Food Security, a country can only be considered as food secure if all of its members have access to sufficient, safe and nutritious food at all times (Parvathamma, 2015). The key phrase here is "all times" and this is exactly where countries in the SSA have a problem. In other words, although production in this region is high, it is not sustained in all seasons due to poor farming practices and management systems (Bjornlund et al., 2020).

Modern agricultural practices techniques such as the use of chemical fertilizers and agrochemicals are effective in increasing yields in the short-run but may be injurious to agricultural ecosystems in the long-run (Rezvanfar et al., 2009; Onder and Ceyhan, 2011; Kumar et al., 2019). These modern practices also impact the soil negatively by bringing about liquefaction of the soil and an increase in the salinity and alkalinity of the soil (Ali et al., 2020; Ervin et al., 2019). According to Brodt et al. (2011), sustainable farming involves a set of practices that can aid farmers in achieving higher crop yields, while simultaneously safeguarding the long-term health and sustainability of the environment. Although there are various expert opinions on what constitutes sustainable farming, it generally entails ecologically sound, climate-resilient, socially responsible, and economically profitable methods of crop production, as noted by Bjornlund et al. (2020), El Chami et al. (2020), and Hrustek (2020). Thus, the interdependent aspects of sustainability—economic, social, and ecological—are the foundation of sustainable farming. The trio, which can be summarized as the farms, farmers and the environment, will

have to interact with each other in harmony; if food production is to be sustained over a long period of time. Sustainable farming practices involve components such as direct seeding without prior ploughing with either a plough or a hoe, leaving crop residue or planting of cover crops, and inter-cropping or crop rotation with legumes (Peigne et al., 2016; Thierfelder et al., 2015). The benefits of these practices are the significant reduction of production cost (Dalton et al., 2014), increased yields (Khoshgoftarmanesh et al., 2010), improved soil structure and reduction of soil erosion (Shah & Wu, 2019). The application of organic manure also helps enrich the soil and increases crop yields with minimal negative agro-ecological impact (Agula et al., 2018; Fung et al., 2019). Sakapaji (2022), believes this concept will be successful if the various stakeholders of farming shift attention from the rigid and robust industrial, money-making system of farming to a more dynamic, innovative and natural way.

1.1 Problem Statement

In the past, farmers in the North-East part of Ghana including those living in Chereponi have often resorted to agrochemicals such as synthetic fertilizers, weedicides and pesticides with only a short term benefit (Demi & Sicchia, 2021). These practices despite ensuring higher crop yield is believed to reduce the carbon sequestration ability of the soil and impact the soil structure negatively (Rehman et al., 2022). The situation is compounded by the extreme low levels of poverty, literacy and lack of development (Rahman & Debnath, 2015)). These factors have exacerbated the tendency of farmers to engage in negative farming practices such as deforestation, bush burning, soil tillage and monoculture (Adenle & Ifejika Speranza, 2020).

With the rising concerns about the environmental risks associated with modern agricultural practices (Rezvanfar et al., 2009), there has been a call for government to come up with ways by

which fertility of farmlands and sustainability of the ecosystem can be achieved while concurrently ensuring increased crop yields (Raghu et al., 2014).

While there has been an increase in governmental policies both at the national and regional levels to transform rural settings and promote food security through sustainable farming, the agenda has often been rendered ineffective owing to economic, social and environmental issues that persist in the region. For instance, the ratio of Agric Extension Agents (AEA) to farmers stands at a minimum of 1:5000, a value that is believed to be inadequate to ensure implementation of governmental policies on boosting community participation in best farming practices (Appiah-Twumasi et al., 2020). Furthermore, inadequate funds, late release of funds and poor roads make it even challenging for these officers to access the various communities (Banson et al., 2018). The end result is proliferation of policies, regulations and projects on paper, yet very little progress observed in pushing the green economy agenda (Sarpong & Anyidoho, 2012).

Beyond proliferation of policies lies the need for stakeholder collaboration. By stakeholders, this implies governments, NGO's, the local authorities, private institutions and most importantly the local community members and farmers. As far as collaboration among stakeholder group is concerned, there has been some form of progress made in Chereponi District. The Chereponi Farming Project (CFP) and the North-East Ghana Integrated Development Project (NGIDP) for example are on-going projects that seek to transform the rural communities through public participation and promotion of sustainable farming. Their collaboration with the government was apparent through their capitalizing on the planting for food and jobs projects in the region. These NGO-funded programmes aim at boosting community mobilisation in a way that sustainable farming practices will be easily understood by the indigenes. The CFP is committed to exploring

all indigenous ecological-friendly farming practices and in the process find ways of integrating them into existing policies with 2000 farmers having been recruited into the programme so far. The NGIDP aims at boosting the participation of women and young people in the farming sector as well as involving farmers in on-going research that seeks to evaluate the effectiveness of agricultural extension officers in the region.

Unfortunately, the response to these policies and programmes on sustainability farming practices by farmers in the district has been negative (Abdul-Hanan et al., 2014). This is so, mainly because of the intensive cultivation of farmlands in the district due to the high demand for food (Abdul-Hanan et al., 2014). There are questions regarding local farmers' knowledge and perception of sustainable farming practices and how these factors affect their intentions to adopt sustainable farming practices. There are also questions regarding how NGOs and government extension officers perceive sustainable farming and whether or not implementation of their strategies is perceived by the indigenes as feasible and effective. The purpose of this study is therefore to evaluate the perception, contribution and collaboration among the various stakeholders as it relates to the practice of sustainable farming.

1.2 Objectives of the Study

1.2.1 General Objective

The main objective of the study is to examine how the various stakeholders collaborate to enhance sustainable farming practices in the Chereponi District.

1.2.2 Specific Objectives

- Determine the knowledge level and perception of stakeholders on sustainable farming practices.

- Determine whether or not the knowledge and perception of farmers on sustainable farming influences their intention to adopt sustainable farming practices.
- Ascertain the reasons behind farmers' decision to adopt sustainable farming strategies.
- Examine how stakeholders collaborate with government extension officers for the training of farmers and the implementation of sustainable farming strategies in the Chereponi District.
- Investigate barriers to the adoption and implementation of sustainable farming practices and how barriers influence farmers' decision to adopt sustainable farming practices.

1.3 Research Questions

- What is the level of knowledge and perception of farmers on sustainable farming practices?
- What effect does the knowledge and perception of farmers on sustainable farming have on farmers' intention to adopt sustainable farming practices?
- What are the reasons behind farmers' decision to adopt sustainable farming practices?
- How do stakeholders collaborate with government extension officers for the training of farmers and the implementation of sustainable farming strategies in the Chereponi District?
- What are the barriers to the adoption and implementation of sustainable farming practices?
- How do the barriers influence farmers' decision to adopt sustainable farming practices?

1.4 Significance of the Study

When successful, the findings of this study will uncover diverse perspectives on sustainable farming among stakeholders specifically within the Chereponi District in the North-East Region

of Ghana. Identifying gaps in the implementation strategies of these stakeholders aims to foster collaboration, alleviating tensions and contributing to a comprehensive understanding of sustainable farming practices in the local context. The identification of shared sustainable farming practices among various NGOs could serve as a foundation for local government policies, potentially leading to the development of a national policy on sustainable farming, with a focus on the unique dynamics within the Chereponi District.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.0 Introduction

This chapter focuses on extant literature in the area of farmers' knowledge on sustainable farming, sustainable farming strategies used by farmers, as well as the barriers to the adoption of sustainable farming have also been highlighted.

2.1 Concept of Sustainable Farming

Sustainable farming as a concept has been said to have three main components which comprises an environmental dimension, economic and social dimension (De Olde et al., 2016; Lichtfouse et al., 2009), popularly known as sustainable agriculture (Alshaal & El-Ramady, 2017). Out of the three most dominating dimensions of sustainable farming, the environmental aspect is the most focused on as this has a direct bearing on human life and to a large extent, the very survival of all living species (Kerekes et al., 2018).

Lately, there has been a lot of debate on a clear and precise definition for sustainable farming that will help both researchers and farmers alike to have a clear and standardized way of measuring its effect on the environment (Velten et al., 2015). If one thing is certain, then it is that achieving such a result has proven to be very challenging. This is because the concept of sustainable farming in itself is very complex and replete with diverse dimensions that are also quite ambiguous to a large extent (Velten et al., 2015). Examination of information from extant literature shows two widely used definitions of sustainable farming. There are those who look at the concept as a philosophical way of thinking that is fuelled by a person's consciousness of some agricultural activities and their adverse consequential effects on the environment (Thompson, 2007), and others who view it as a strategically oriented process that allows for

continuity and sustainability of the environment (Noble & Nwanekezie, 2017). Those who treat sustainable farming as a philosophy look at it as a set of ideologies that affects the farmers' managerial approach to agriculture, while on the other hand, it is seen by those who look at it from a strategical point of view as a systematic way of implementing a set of strategies to enhance environmental sustainability (Morelli, 2011).

The strategically oriented perspective of sustainable farming contends that sustainable farming should not be seen or treated as a system with a generic meaning or definition because doing so may limit farmers' options. Instead, "sustainable farming should concentrate on how to sustain individual and case-specific innovations and processes" (Trigo et al., 2021, p. 3). A universally accepted definition and approach to sustainable farming will be impractical according to Valizadeh and Hayati (2021), because some techniques or farm equipment may not be suitable in areas with diverse conditions or problems. That notwithstanding, in order to be considered a meaningful system that farmers can incorporate in their farm management systems, sustainable farming has to be scientific, structural and quantifiable (Trigo et al., 2021).

2.2 Knowledge and Perception of Farmers on Sustainable Farming Practices

It goes without saying that knowledge of eco-friendly agricultural strategies is a necessary condition for farmers to embrace more sustainable farming methods. In general, accessibility to pertinent and trustworthy data is vital for farmers to implement agricultural technologies (Llewellyn, 2007). Farmers tend to adopt organic agriculture when data on the pros and cons of organic agriculture is made readily available to them by agricultural extension officers (Kallas et al., 2010). Attending development programmes organised by extension officers also encourages farmers to practice ploughing that is more conserved (D'Emden et al., 2008).

Knowledge of volunteer programmes initiated by government policies is also a requirement for farm owners who want to embrace eco-friendly agricultural methods. In a survey conducted in some parts of Europe, farm owners frequently stated that their refusal to join in agricultural projects sponsored by the government or NGOs was due to their ignorance of the benefits offered by the projects (Pavlis et al., 2016). As per the reports of Ahnstrom et al. (2009), it is true that across many regions of the world, farm owners are not well-informed about some of these projects which tend to affect their decisions to implement eco-friendly agricultural methods.

Personal characteristics, as shown by Skaalsveen and colleagues (2020), are crucial to understanding why farmers act in the way that they do. According to Skaalsveen et al. (2020), farmers' behaviour is influenced by a confluence of social, psychological, and environmental elements. A particular farm management approach may be regarded to have implications on the environment based on information that farmers possess (Nguyen et al., 2019). To what extent such implications are perceived as advantageous or detrimental depends on farmers' objectives and values (Lavoie & Wardropper, 2021). It's not uncommon for farmers to pursue multiple objectives, such as the goal to make profit or to achieve an independent means of production, which they may value differently depending on the situation they are in at the time (Leeuwis & Aarts, 2020)

That said, there is also a good chance that a collaboration between stakeholders (farmers, government and NGOs) will likely impact the adoption of sustainable farming practices (Leeuwis & Aarts, 2020). “These interdependencies between stakeholders can be vertical (depending on the behaviour of other value chain actors), horizontal (depending on the behaviour of other farmers), temporal (depending on decisions made in the past or anticipated for the

future), or intra-individual (depending on the acceptance of social norms)" (Leeuwis and Aarts 2020) as cited in (Kenfack Essougong et al., 2020, p. 710).

2.3 Government Extension Officers and NGOs

All over the world, agricultural extension services are used as a means to transfer agronomic expertise and knowledge to indigenous farmers (Taylor & Bhasme, 2018). Extension services include capacity building exercises which incorporates different farming techniques that can be adopted and implemented by local farmers on their farmlands (Taylor & Bhasme, 2018). The purpose behind these capacity building exercises is for indigenous farmers to be able to adapt their farming methods to suit different climatic and environmental conditions as and when the need arise without suffering to achieve high crop yields or sustain their farmlands (Zossou et al., 2020). According to Gitau et al. (2008), in Sub Saharan Africa, peasant farmers who are typically found in the villages or remote areas of a country are usually the backbone of agronomic production and supply. These local farmers usually require the use of a holistic and diversified model that make use of different ways to convey information and transfer expertise about agricultural production (Sousa et al., 2016). In Ghana, agricultural extension officers fill the roles of experts in agronomic matters and act as the bridge that connect local farmers to modern innovations in the area of agriculture (Antwi-Agyei & Stringer, 2021).

The Ministry of Food and Agriculture (MOFA) has given agricultural extension officers in Ghana the responsibility to share substantiated and validated agro - based methods and strategies with farmers in an inclusive fashion (Okorley, 2007). These individuals reside among farmers in rural communities, as a result, in Ghana's remote villages, the agricultural extension officers have become the primary source of information of farming practices (Issahaku, 2014). Indigenous and peasant farmers are exposed to the right scientific agrarian information that

changes their perspective on the practices to adopt, equips them with the necessary skills needed, and shapes their behaviour to help them achieve higher crop yields and income (Azumah et al., 2018).

Due to the fact that extension officers in the agricultural sector are widely regarded by farmers as experts in the area of agricultural practices, they are careful not to give farmers erroneous data on the adoption of a method or strategy so they do not lose their credibility and level of trust among farmers (Azumah et al., 2018). The primary conduit connecting local farmers and stakeholders in the farming industry is hence agricultural extension officers. To boost production and increase crop yields (Emmanuel et al., 2016), fight income inequality, and ensure sustainable development, agricultural extension service is essential (Anyanwu & Anyanwu, 2017). Training of farmers by extension officers is also a critical factor in the adoption of sustainable farming practices (Agula et al., 2018).

NGOs likewise employ comparable techniques to guarantee that farmers have the best assistance they require to produce crops with excellent yields. NGOs interact with farmers through a method that relies on consensual association and include mobilizing, enrolling, and educating specific farm owners in the designated enclaves (Guliyev et al., 2019). All local peasant farmers are normally welcome to join these associations. Farmers are able to decide whether to join the associations or not during the awareness phase of the capacity building exercise as it is usually during this stage that NGOs reveal their modus operandi to farmers (Bright et al., 2011).

To strengthen their managerial abilities and practical expertise for effective material use and increased efficiency, the enrolled farm owners acquire training and capacity building assistance from extension officers recruited by NGOs on how to grow and sell their farm produce (Avea et al., 2016). Farmers are advised to start associations so that they can take full advantage of the

training offered by NGOs to improve their methods of production and sales after harvest (Bright et al., 2011). By training group members, assisting them to secure credit to procure farm inputs, and helping them sharpen their negotiation skills at the marketplace, NGOs and government extension officers are able to work together to enhance the capacity of farmers (Avea et al., 2016).

The NGOs also provide support to farmers in accessing production resources such as seeds, fertilizer, agro-chemicals and machinery either by supplying it themselves as credit or by linking farmers to financial institutions (Salifu et al., 2012). The need for the NGOs to link farmers to banks to access credit is necessitated by low trust between farmers and financial institutions (Sheperd, 2007) as well as farmer's inability to provide collateral as required by the banks for credit or loans (Gramzow et al., 2018). With regards to marketing, NGOs are either involved in scouting for markets and linking farmers with the identified markets or marketers, or in establishing an aggregation company that buys produce from farmers and sells to processing companies (Danso-Abbeam et al., 2018).

Additionally, NGOs by self-financing or credit sourcing from microfinance institutions and rural agricultural banks are able to assist farmers in gaining access to farm inputs like manure, seedlings, herbicides and pesticides, and equipment (Bright et al., 2011). NGOs serve as the conduit between financial institutions and farmers due to the lack of confidence that exist between farmers and banking firms which is mainly caused by the failure of farmers to offer securities for the loans they want. Furthermore, NGOs work to commercialize farm produce in one of two ways: either they identify buyers of the produce and connect them with farmers, or they create a company that acts as an intermediary to buy farm produce from farmers and sell to other companies that specialize in turning natural farm produce into finished goods.

2.4 Sustainable Agriculture in the North-East Region

In the agricultural sector of the North-East Region of Ghana, particularly in the Chereponi District, several challenges hinder the achievement of increased productivity (Zeller, 2016). The region's agricultural landscape faces multifaceted obstacles that impact the livelihoods of local farmers and the overall food security of the area. Among these challenges are issues related to climate variability, inadequate infrastructure and socio-economic constraints (Botchway et al., 2016; Mahama, 2019).

The North-East Region experiences a semi-arid climate, characterized by irregular and insufficient rainfall. This climate variability poses a significant threat to crop production, leading to water scarcity and unreliable growing seasons (Jamaldeen, 2023). Consequently, farmers in the Chereponi District grapple with the challenge of selecting suitable crops that can withstand the prevailing climatic conditions while still meeting their economic needs.

The lack of modern infrastructure, including reliable irrigation systems and transportation networks, further exacerbates the difficulties faced by farmers (Adongo, 2015). Insufficient access to water for irrigation limits the ability to cultivate crops throughout the year, contributing to low agricultural productivity (Dinye & Ayito, 2013). Additionally, challenges in transportation hinder the timely and efficient movement of agricultural produce to markets, affecting farmers' income and the overall economic development of the region.

Socio-economic factors, including poverty and a lack of access to credit facilities, further constrain the agricultural sector. Farmers may struggle to invest in necessary inputs, such as quality seeds, fertilizers, and mechanized equipment, limiting their ability to adopt efficient and modern farming techniques (Anang & Asante, 2020). Addressing these socio-economic

challenges is integral to fostering a conducive environment for agricultural development and increased productivity.

2.4.1 Sustainable Agricultural Strategies used by Farmers

Implementing sustainable practices at farms may reduce the environmental undesirable effects resulting from agricultural activities Gebska et al. (2020). In fact, different production methods can be used in plant production to ensure its sustainability (Pabi et al., 2019). They include, among others, precision production, conservation, organic agriculture, agroforestry, and integrated agro-farming systems. Sustainable practices may help to preserve the ecosystems, to promote economic stability for farms, and to improve farmers' quality of life (Gebska et al., 2020). For the purposes of this study, conservation agriculture and organic agriculture will be considered. This study chose conservation agriculture and organic agriculture as the key strategies to examine because "both dominate the most commonly used approaches/techniques employed by farmers who engage in sustainable farming practices in West Africa" (Garzon Delvaux et al., 2020, p. 10).

In the North-East Region of Ghana, there exist noteworthy local innovations that can be characterized as sustainable farming practices. These innovative approaches are significant and merit discussion. Given the semi-arid climate in some parts of the North-East region, where rainfall is often irregular and insufficient for optimal crop growth (Golla, 2021), the adoption of water harvesting techniques becomes imperative for ensuring agricultural sustainability (Sharma et al., 2021). Local farmers in the region have innovatively embraced various approaches, ranging from traditional methods to modern rainwater harvesting systems, to mitigate the impact of water scarcity on their crops. One such traditional practice is the use of Zai pits. Farmers dig small planting pits and fill them with organic matter, creating micro-catchments that capture and

retain water during rainfall (Ehiakpor et al., 2019). This method helps enhance soil fertility, water infiltration, and moisture retention (Danquah et al., 2019). Recognizing the need for more scalable solutions, some farmers have adopted modern rainwater harvesting systems. In certain instances, farmers construct simple yet effective roof-top harvesting systems. By channelling rainwater from rooftops into storage containers, they create a sustainable water source for irrigation during dry periods (Asante, 2011). The combination of traditional methods, such as Zai pits, with contemporary innovations like rooftop water harvesting reflects the adaptive and forward-thinking nature of local farmers. By integrating both traditional wisdom and modern techniques, they demonstrate a resilience that ensures agricultural productivity in the face of climate variability.

2.4.1.1 Conservation Agriculture

Conservation agriculture is defined in several ways but the key components are to keep soil disturbance by ploughing or other soil tillage practices at a minimum, leave crop residue in the field and use crop rotation to control diseases (Hobbs et al., 2008). While these practices contribute to improved water retention and reduced soil erosion, the explicit focus is not always on water or soil moisture conservation. However, the holistic approach of conservation agriculture often results in indirect benefits for water and soil moisture retention (Palm et al., 2014).

The claimed benefits are better soil quality resulting in higher and stable yields. According to Brouder and Gomez-Macpherson (2014) however, there were some significant short-term yield losses recorded for Sub-Saharan Africa in annual crops: maize, rice, cowpea and sorghum. That said, conservation agriculture is recorded to have increased yields in dry climates when combined with appropriate agronomic management (Rusinamhodzi et al., 2011).

2.4.1.2 Organic Agriculture

Organic agriculture is "a food production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects" (Garzon Delvaux et al., 2020, p. 16).

Although organic farming is not a perfect equivalent to sustainable farming, it has been shown to outperform conventional farming across many sustainability criteria (Ponisio et al., 2015). Some of the benefits of organic farming includes; higher crop yields, soil nutrient retention and soil-water absorption capacity. In regions with mild temperatures however, these benefits may not be fully guaranteed (Tuomisto et al., 2012).

2.5 Hindrances to the Implementation of Sustainable Agriculture

The practice of sustainable agriculture (SA) is mostly challenged with a lot of barriers, especially if the farmer attempts to adopt SA or incorporate its methods fully into his or her farm management system (Roesch-McNally et al., 2018). Most of the barriers to the adoption of SA are geographically based, even though from time to time, may be seen to overlap with other barriers faced by farmers globally. According to Siebrecht et al. (2020) there are four types of barriers to the adoption of SA and they include methodological barriers, theoretical barriers, personal barriers and practical barriers.

Theoretical barriers stem from the ambiguity of the concept of SA, which is coupled with the numerous interpretation that stakeholders give to SA and that makes it difficult for a one size fit all definition to be accepted and fully incorporated into farm management.

Methodological barriers are characterized by the difficulty in the practical measuring and assessment of the concept of SA.

Personal barriers are the idiosyncratic character traits, attitudes, skills and knowledge of the adopter (farmer) that prevents him or her from practicing SA.

Practical barriers are mostly external issues that makes it difficult for the farmer to either adapt and/or fully incorporate SA into his or her farm management. For the purposes of this study, personal barriers and practical barriers to the adoption of SA will be considered (Siebrecht et al., 2020).

2.5.1 Personal Barriers

A lot of times people fail to utilize what they learn even when it is supposed to help them or improve their lives. There is always a contrariety between what is learned and what is implemented, a situation that is defined as the implementation gap (Peters et al., 2013). To know what to do is good, but to put to use what you know is much better. The adoption of sustainable farming is influenced by a farmer's knowledge, education, risk-taking mentality, or farm size (Nazeer & Fuggate, 2019). This means that the farmer can be hindered by what he or she does not know – knowledge gap, but most importantly, he or she is likely to also be affected by his or her behaviour towards the adoption of sustainable farming (Sumane et al., 2018). Even though there are many variables that may prompt the farmer to make adjustments or completely neglect his or her old farming systems to the adoption of a new one, he or she may still decide to do nothing at all and carry on with business as usual (Darnhofer et al., 2010). On a farm, it is all about the farmer, and what he or she decides to do. No matter the decision the farmer makes

however, it is sure to be controlled by his or her personal goals and values as well as any possible obstacles that may or may not arise (Milestad et al., 2012).

According to Darnhofer et al. (2010), a farmer's land can be used in whatever way he or she chooses. More so, when he or she is the sole owner of the land. The problem with this is that, some people may react negatively to this scenario of free-choice and may consequently decide not to engage in the adoption of sustainable farming, especially when faced with uncertainty about cost, feasibility and profitability. Olbrich et al. (2014) argued that in order for farmers to be motivated to engage in new farming systems (sustainable farming), there should be an incorporation of social norms into the personal norms of the farmers. They intimated that, social norm which acts as a moral obligation on the farmer should be activated through the awareness of agricultural situations that have negative (unsustainable) impacts on the environment, and the steps to take to avert such effects (Olbrich et al., 2014). Van Poeck and Ostman (2021) opined that a farmer should be made to understand that there are shortfalls, i.e. unsustainable conditions or situations that can be created through unsustainable farming practices, and know how to correct them. This they believed will be ideal for the daily decision making and management of the farm (Van Poeck & Ostman, 2021).

2.5.2 Practical Barriers

When we consider a successful farm, one that is both financially and socially successful, the question of why the farmer should make modifications or adaptations emerges. What benefits can a farmer expect from improving the farms sustainability, why should he or she be driven to do so, and what possibility will impact decisions and behaviour? All these are questions that farmers seek answers to in their bid to adopt sustainable farming. In Ghana, information apparent in extant literature (Adolwa et al., 2017; Kotu et al., 2017; Issahaku & Abdulai, 2020; Mahama

et al., 2020; Zakaria et al., 2020) shows that factors such as extension services, distance to input, education of farmer, farmer perception of agricultural innovation, availability and non-availability of farm input, membership of farmer associations, etc. are all influential in the adoption of agricultural innovations.

In a study by Zakaria et al. (2020) where farmers' involvement in programmes designed to train them on sustainable farming practices was assessed to determine the adoption of sustainable farming practices, it was found that adoption of sustainable farming practices was impacted by the educational background of farmers, access to extension services and membership of farm associations. For farmers who took what was taught them serious and were drastic in their practice of sustainable farming, the findings revealed that availability of labour by reason of family size and active involvement in training programmes were crucial explanatory factors.

According to Adolwa et al. (2017), some farmers refused to adopt sustainable farming practices because they do not have the means to acquire for example additional labour and not necessarily because they do not subscribe to the ideologies of sustainable farming systems. Mahama et al. (2020) carried out a study on the sustainability of the production of soybean in Ghana, the north-east region to be precise. Their findings revealed that farmers' knowledge and perception of sustainable farming, farmers' educational level and age, as well as access to extension officers influenced their decision to adopt sustainable ways of producing soybean in the north-east part of Ghana.

In other areas like Kenya, Nyaga et al. (2015) reported that farmers with temporary possession of lands favoured the use of artificial-chemical fertilizers over the practice of mixed cropping in order to produce more. Nyaga and colleagues' findings were supported by findings of Nkomoki et al. (2018) which stated that in Zambia, temporary land tenure and ownership of lands by

farmers influenced their adoption of sustainable farming practices. According to Fabe and Grote (2013) and Kassie et al. (2013), farmers' years of experience in farming tend to impact the choice to practice crop rotation by farmers in Tanzania.

Other factors like gender, age, marital status, years of farming, and family size were also recorded to have an effect on the adoption of agricultural innovations (Tiamiyu et al., 2009; Matata et al., 2010; Simtowe et al., 2016; Djokoto et al., 2016; Ali et al., 2018). In a study by Matata et al. (2010) on the adoption of modern-day agricultural practices by farmers, male farmers compared to their female counterparts were found to be more inclined to the use of artificial-chemical fertilizers. Tiamiyu et al. (2009) revealed in their study that farmers who were far ahead in years favoured the use of conservation agriculture over their younger counterparts who favoured modern-day agricultural practices. The foregone result was however refuted by findings of Simtowe et al. (2016) which showed that modern-day agricultural practices like the use of chemical fertilizers were more likely to be adopted by the elderly due to the fact that they tend to have more experience compared to their younger counterparts on what works and what does not. According to findings of Ali et al. (2018) on factors responsible for the use of chemical fertilizer by farmers in cocoa production in Ghana, marriage and family size was seen to be statistically significant to the drastic use of fertilizer by farmers. Number of years farming by farmers was also recorded to be significant, with a positive relationship seen between farmers' years of experience and the use of chemical fertilizer. That said, changes are typically done when they improve the farmers' profitability or sustainability of farm (Agula et al., 2018). In the view of Darnhofer (2014), economic and financial difficulties are important drivers of decisions in farm management and are required for long term viability. Thus, if a production system is not profitable, it cannot be perpetuated overtime (Gliessman & Rosemeyer, 2009). Hence, economic

concerns and interest might almost always operate as a roadblock to sustainable farming long term viability (Rodriguez et al., 2009). As a result, farmers tend to create more sustainable production systems when current systems are no longer economically viable or when financial incentives are provided, and this applies to farming systems all around the world, (Bowman & Zilberman, 2013). The foregone is corroborated by Suhardiman et al. (2016), who revealed in their study that farmers prefer to maximize their revenue by growing high value cash crops rather than producing more food, such as rice, to feed their families.

According to Siebrecht (2020), sustainability-related adaptations can have a wide range of financial consequences for a farm. Simply by deciding to adapt ones farming methods to correspond with sustainable farming methods can generate cost, to begin with. To increase soil fertility and increase the farms yield level the sustainable farming way for example may prompt the adoption of new technology or a complete modification of old ways of doing things. Then there is also the issue of transition cost which must also be taken into account whenever the farmer decides to modify his or her management approach for example or completely adopt a new approach entirely (Siebrecht, 2020). In the opinion of Komarek (2018), farmers are most likely to assess the prospective risk of whatever farming practices or strategy they wish to adopt. If the likelihood of an adaptation from an old farming system to a new one is costlier and risky than it is profitable, then farmers will be more inclined to maintain their old way of doing things (Komarek, 2018). Agricultural risk aversion differs among farmers and thus may or may not always be a factor that prevents the adoption of a new farming system or the adaptation from an old one (Lapple & Van Rensburg, 2011).

THEORETICAL FRAMEWORK

3.0 Introduction

This chapter focuses on the theoretical framework underpinning the research study and seeks to explain how it helps provide a framework for examining and understanding the phenomenon (Farmers' knowledge and adoption of sustainable farming practices) under study. The theory of planned behaviour and the conceptualised model of behavioural factors by Dessart et al. (2019) were the two theories considered in this study.

3.1 Theory of Planned Behaviour

According to Aizen (1991), the Theory of Planned Behaviour is concerned with how an individual's decision to engage in a particular behaviour is primarily driven by their intentions, which are in turn affected by three independent constructs: attitude, subjective norm (social pressure) and perceived behavioural control (ease/difficulty).

According to the Theory of Planned Behaviour, intention is the most important predictor of behaviour, which relates to an individual's motivation or willingness to invest effort in performing the behaviour (Bamberg et al., 2007). The greater the intention, the more likely an individual is to enact the behaviour. Intention, in turn, is determined by three socio-psychological constructs: attitude, subjective norm and perceived behavioural control (Ajzen, 1991).

In line with the Theory of Planned Behaviour, attitude is defined as a positive or negative evaluation of performing a given behaviour (McEachan et al., 2016). Thus, the intention of farmers to practice sustainable farming will increase if they perceive that using this practice is useful and beneficial and will lead to positive results for them. Subjective norm encapsulates the

level of social pressure or expectations felt by an individual from significant reference persons to engage or not to engage in a particular behaviour (ibid). It is argued that people tend to conform to subjective norms due to a fear of social exclusion (Bamberg & Möser, 2007). Thus, if farmers feel that people whose opinion they value confirm a given behaviour (sustainable farming) then their own intention to perform the behaviour should increase (Rezaei et al., 2018). Schaak and Mubhoff (2018) found that subjective norms positively influenced farmers' intentions to adopt grazing practices that were ecologically friendly in Germany. Finally, perceived behavioural control is an individual's perception of the ease or difficulty related to their performing a given behaviour, which is also related to the presence of facilitating conditions, sometimes referred to as situational constraints (Bamberg & Möser, 2007). This construct reflects the extent to which an individual perceives that the behaviour in question is under his/her volitional control (Hyland et al., 2018). Therefore, farmers' intentions to sustainable farming should increase as the degree of their perceived control over performing this behaviour becomes greater (Adnan et al., 2017). As a general rule of thumb, the more positive the attitude, subjective norm and perceived behavioural control, the greater the likelihood of adopting the behaviour in question (herein, sustainable farming) (Wang et al., 2019).

Previous research has shown that attitude, subjective norm and perceived behavioural control are positively associated with farmers' intentions to adopt riparian zone management in Australia (Fielding et al., 2005), improved grassland management in Brazil (Borges et al., 2014) and on farm food safety management in Iran (Rezaei et al., 2018). However, Wauters et al. (2010) only found attitude to be an important factor determining farmers' intentions to adopt soil management practices in Belgium. Elsewhere, Hyland et al. (2018) confirmed the importance of attitude and perceived behavioural control, but did not find subjective norm to be a significant

determinant of farmers' intentions to adopt grazing management practices in Ireland. Typically, the influence of the Theory of Planned Behaviour constructs on intentions varies depending on the behaviour of the farmer and context under study (Adnan et al., 2017). On this backdrop, this study employed the Theory of Planned Behaviour to help determine the knowledge and perception of farmers in the Chereponi District on sustainable farming.

3.2 Behavioural Factors (Conceptualized Model of Dessart et al.)

According to Dessart et al. (2019), there are three types of behavioural factors that have a bearing on decision-making: dispositional, social and cognitive. Dispositional aspects, which relate to a specific person include things like attitude, ideals, convictions and preferences (Malle, 2011). Social norms that may encourage farmers to adopt a specific practice or more sustainable practices generally are among the social factors that impact farmers' decision. Cognitive factors denote farmers' judgments of the merits, expenses, and dangers connected with adopting certain sustainable strategies and the belief that they have the competence to incorporate sustainable farming practices in their day to day activities. For purposes of this study, only the cognitive factor of Dessart et al.'s conceptualized model of behavioural factors was considered. The reason being that, the other two aspects of their behavioural factors, namely, dispositional and social had already been covered in the Theory of Planned Behaviour.

3.2.1 Cognitive Factors

The learning curve of farmers, coupled with their ability to assess the expenses, advantages, and risks associated with the adoption of sustainable farming practices has been proven to have a strong impact on farmers' decision to practice sustainable farming. Farmers' personal sense of

mastery in implementing sustainable farming practices on their farmlands has also been proven to have an effect on farmers' decision to adopt sustainable farming practices.

3.2.1.1 Farmers' Personal Sense of Mastery

Farmers' opinion of their capacity to manage their behaviour is related to their assessments of having or not having the necessary knowledge and span of years to carry out a task. The inclination of farmers to indulge in tasks or projects that will expedite the assimilation of the concept of sustainable farming and simplify the process of adopting sustainable farming strategies will be greatly enhanced provided farmers hold the strong belief that they possess the requisite skill needed to achieve that goal (Defrancesco et al., 2008; Issahaku & Abdulai, 2020). Information apparent in extant literature showed that conversion to the production of vegan food and organic products was especially resisted by farm owners who felt they had insufficient time or resources to do so (Grabowski, 2014; Lapple & Kelley, 2013). Additionally, acting reluctant towards the adoption of sustainable agricultural activities was very characteristic of farmers who had problems with the use of farm equipment/tools (Kuhfuss et al., 2016b). Farmers were also less susceptible to the idea of incorporating sustainable farming methods into their daily activities once they felt it was hard to implement for example, soil sustainability strategies such as limiting ploughing on farmlands (Wauters et al., 2010). On this backdrop, the null hypothesis is formulated:

H0: There is no significant relationship between farmers' perception of experiencing technical difficulties when implementing sustainable farming practices and their subsequent decision to adopt sustainable farming practices.

3.2.1.2 Farmers' Assessment of the Expenses and Advantages Associated with Adopting Sustainable Farming Practices

Farmers' decision to incorporate sustainable agricultural practices into their everyday activities may be dependent upon their assessment of the possible expenses they may incur and the profits they are likely to gain (Michel-Guillou & Moser, 2006). Farmers are more likely to adopt sustainable agriculture practices, per Trujillo Barrera et al. (2016), provided farmers anticipate receiving state assistance, such as tax breaks, agricultural extension, and equipment subsidies. According to Uematsu and Mishra (2012), farmers decide against the practice of traditional farming especially the adoption of organic methods because it elevates labour expenses even though it lowers input expenses. Kallas et al. (2010) followed by Läpple and Kelley (2013) on the other hand intimated that farmers are more likely to switch to organic farming if they estimate improved prices for their produce and appreciate the reduced costs of production that comes with it. In the opinion of Schulz et al. (2014), farmers who believe in the ecological benefits associated with the practice of sustainable agricultural methods are more likely to adopt sustainable farming practices than those who do not share the same beliefs. Consequently, farmers' decision to practice sustainable farming may vary based on their perception of the costs and profits associated with it (Marcillo & Miguez, 2017).

Time is also a factor when considering the adoption of sustainable farming practices. According to Bocquého et al. (2014), because there is an inverse relationship between the immediate cost and benefit of sustainable farming practices to farmers when they attempt to engage in it, deciding to implement sustainable farming sometimes becomes a challenge. Implementing sustainable methods frequently may sometimes result in short-term added expenses like spending

extra capital on equipment or loss caused by the reduction in harvest, while the advantages such as increased fertility of the soil and sustainability of the environment usually come later (Bocquého et al., 2014). So amongst the group of people that are engaged in farming, some do so for personal financial gains, whereas others prioritize profits that go hand in hand with environmental benefits. The latter is usually a consequence of sustainable farming even though it is usually costlier for farmers to apply. On this backdrop, the following null hypothesis (H0) are formulated:

1. There is no significant relationship between farmers' assessments of expenses and profits and their adoption of sustainable agricultural practices.
2. Farmers' anticipation of state assistance, such as tax breaks, agricultural extension, and equipment subsidies, does not significantly influence the adoption of sustainable agriculture practices.

3.2.1.3 Farmers' Perception of Risk

Farmers' conceptions of economic burden are reported to trigger a variety of actions, including the use of new equipment and adoption of new agricultural practices (Marra et al., 2003; Ghadim et al., 2005). Given the significant economic risk farmers typically experience in their work, it is possible they may decide against the implementation of sustainable farming strategies if they perceive it to be non-economically viable (European Commission, 2017b). According to Serra et al. (2008), certain sustainable methods carry a little bit more economic threat than modern methods. Using organic agricultural strategies in farming for example increases the chance of yield loss compared to the use of modern day agricultural methods as it frowns upon the use of fertilizers or herbicides on farms (Gardebroek, 2006). Monetary benefits from practicing

mechanical ploughing is also less guaranteed compared to the practice of standard ploughing (Kurkalova et al., 2006).

According to Colen et al. (2016) when the farmer deems the adoption of sustainable farming to be riskier in terms of losses to be incurred compared to the profits he or she may enjoy by practicing sustainable system of farming, then there is a high possibility of a decision against the adoption of sustainable farming practices. Practically speaking, this asserts that potential income surges resulting from lower prices of fertilisers and greater market values of their crops will have less of an impact on farmers' judgment calls than the dangers of crop yields caused by the implementation of sustainable farming methods (Colen et al., 2016). Based on the foregoing, the following alternative hypothesis are formulated:

H1: There is a significant relationship between farmers' perception of sustainable farming practices increasing the risk of crop failure and their decision to adopt sustainable farming practices.

H2: Farmers who perceive sustainable farming practices as economically burdensome will be less likely to adopt them compared to those who perceive them as economically viable.

The various cognitive aspects namely, farmers' personal sense of mastery, farmers' perception of the expenses and profits, and their perception of the risk associated with adopting sustainable farming were used in examining the barriers to the adoption of sustainable farming practices in this study.

CHAPTER FOUR

METHODOLOGY

Study Area

Chereponi district forms part of the many districts in the Eastern part of the North-East Region of Ghana. The capital of Chereponi District is Chereponi and the district is part of other five Metropolitan Municipal District Assemblies in the Region. The climate condition prevalent in Chereponi is that of continuous dry seasons and only limited months of rain. The main occupation of the people in the area is that of farming and an occasional rearing of livestock (Atinga, 2019).

The Chereponi District has a population of over 53,000 residents, with a near-balanced distribution between males and females (Ghana Statistical Service (GSS), 2014). The majority of the population, approximately 85 percent, resides in rural areas (Mahama, 2019). The households in the district number over 7,100, with an average size of about 8 persons per household (GSS, 2014). Various dwelling units, including compound houses, separate houses, and huts, contribute to the diverse housing landscape. A significant majority of these units are owned by members of the households (Adu-Okoree, 2016).

Economically, about 77.3 percent of the population aged 15 and older are economically active, engaging in various occupations (Ministry of Local Government Rural Development and Environment, 2018-2021). Among the employed population, a substantial percentage is involved in skilled agricultural, forestry, and fishery work, followed by service and sales, craft, and managerial or professional occupations ((MLGRD, 2018-2021). These economic activities form the backbone of the local economy in the Chereponi District.

Satellite Map of Chereponi District

Source: (Mapcarta). https://mapcarta.com/27640956

4.0 Introduction

This chapter highlights the sources of data collected, the research design, data collections instruments, the sampling and procedures techniques of data analysis and the problems encountered during the research.

4.1 Research Design

Blanche et al. (2006, p. 36) define research design as a "strategic framework, a plan that guides research activity to ensure that sound conclusions are reached." This involves plans for data collection, the instrument for gathering information, how information gathered would be processed and analyzed to give meaning to the research findings.

The study used the mixed method involving both qualitative and quantitative in the research. This was to enhance flexibility in data acquisition and to ensure that the researcher collects

sufficient and detailed information for the study (Wimmer & Dominick, 2013). Creswell et al. (2003) advances the view that using the mixed method in a study helps limit the weaknesses inherent in any single method.

4.2 Quantitative Approach

Quantitative research involves the collection of data through numbers, statistical diagrams and figures (Babbie, 2020). This research approach involves much larger number of subjects, and allows the researcher to explain, predict and control a phenomenon, (Leedy & Ormrod, 2005). The results of quantitative studies are generalizable to the population of the study. This makes data from quantitative studies more objective because it reduces researcher's biases substantially, (Babbie, 2020).

The specific quantitative approach used for this study was questionnaire administration among selected sample of respondents. Goodwin (2002) defines a survey as a method which describes, explains and predicts the behaviour, perception and attitude of respondents after posing a series of questions about a particular topic. Although the survey method can be used for both quantitative and qualitative studies (Jansen, 2010), this study adopted the survey method for the collection of quantitative data. According to Creswell et al. (2003), surveys enable researchers to examine relationships between individual's view and their socio-economic characteristics. In addition, surveys are easy to administer, relatively quick and convenient to analyze, (Wimmer & Dominick, 2013).

4.3 Qualitative Approach

The qualitative research method used for this study was the in-depth interview. An interview is "a purposive conversation to elicit response, information or answers to an issue" (Wimmer &

Dominick, 2006, p. 135). Interviews help unearth undisclosed information and provide rich research material for understanding the phenomenon being studied. The researcher also used the interview technique to investigate issues regarding sustainable farming strategies implemented by the local farmers and the challenges they faced in doing so.

4.4 Population, Sample Size and Sampling Technique

Bryman (2011), identifies the population as the focus group of any social or scientific enquiry. It can also be defined as a complete set of elements that possess the characteristics defined by the sampling criteria of a research work (Bryman, 2011). The population of this research involved NGO's, government extension officers and local farmers who are actively involved in the promotion of sustainable farming practices at the Chereponi district. The distribution of the population is that of a clumped dispersion where all stakeholders are clustered together in the district (see Map of Chereponi District). The choice of the district was informed by the considerable progress that has been made by NGOs (Chereponi Farming Project (CFP) and the North-east Ghana Integrated Development Project (NGIDP)) to ensure that majority of the indigenes, predominantly farmers, practice sustainable farming.

Creswell (2009) defines a sample as a small part of something intended as the representative of a whole. A sample of a population is very vital in scientific research, especially in the social sciences, because it is practically impossible for the researcher to engage all individual units in the population (Creswell, 2009). It is therefore important for a researcher to always have a size of the population to work with, and this must be done having in mind the credibility of the entire research. This study considered a sample size of one hundred and fifty-five (155) respondents (local farmers) for the survey questions and two interviewees – one (1) NGO and one (1) government extension officer. By using the Slovin formula that "normally works for simple

random sampling" (Wulandari & Kurniasih, 2019, p. 117) (n = N / (1+N (e)*) with n denoting the actual sample size, N referring to the size of the population, e represents the margin of error and finally (*) denoting the squared root of the margin of error. The following figures were substituted into the formula as follows:

n = 249 (1 + 249 (0.05×0.05))

n = 249 (250 (0.0025))

n = 249 × 0.625 = 155

The convenient sampling technique was used in selecting the one hundred and fifty-five (155) local farmers and the two interviewees – one (1) NGO and one (1) government extension officer in Chereponi because it allowed the researcher to choose respondents base on their accessibility, readiness and availability as opined by (Somekh & Lewin, 2005).

4.5 Data Collection Instrument

Structured questionnaires were used to gather information from the one hundred and fifty-five (155) sampled local farmers. The questionnaires captured the demographic characteristics of the farmers, their knowledge and awareness level about sustainable farming practices as well as their perception on what sustainable farming is. The questionnaires further elicited information about the farming strategies these local farmers employed to ascertain if they were in line with the strategies noted to promote sustainable farming.

The questionnaires were close ended to allow for easy statistical analysis and also to complement the open-ended questions on the interview guide deployed during the qualitative phase of the study. Administration of the questionnaires was not self-made by the respondents (local farmers)

considering the fact that almost all of them could not read in the English language. This means that each respondent was assisted by the researcher and other field agents in the process of answering the survey questions. Further elucidation and clarification was also provided for those who did not understand the content of some of the questions they read. This made it possible for them to make the right choices. Additionally, some of the texts were translated for those who did not speak English and spoke only the Dagbane, Konkomba, and/or Anufo language to make it easier for them to answer the questions appropriately.

Conducting interviews on the other hand involved utilizing distinct interview guides tailored for each participant, consisting of two key stakeholders: a representative from a Non-Governmental Organisation (NGO) and a government extension officer. The interviews commenced with a comprehensive briefing, ensuring that both participants were well-versed in the study's objectives. This approach aimed to foster voluntary and informed responses from the interviewees.

The gathered information was meticulously documented and subjected to analysis through content analysis principles. Content analysis involves deriving meaningful insights from the content of written or verbal communication. In this context, it provided a structured framework to interpret and draw inferences from the information shared during the interviews.

To maintain anonymity and clarity in reference, each interviewee was identified with specific descriptors: 'NGO Person' for the representative from the Non-Governmental Organisation and 'Gov't Ext Officer' for the government extension officer. These identifiers helped organise the findings and contributed to a cohesive understanding of the perspectives shared by these critical stakeholders in the area of sustainable farming practices.

4.6 Data Analysis

The Statistical Package for the Social Scientist (SPSS) software was used to analyse data obtained from the survey. Frequency tables, bar graphs and charts were employed to illustrate findings and answers from respondents. Some of the research questions and objectives were answered using the Chi-Square and Regression statistical method, particularly those within the conducted survey. The multiple regression analysis and the chi-square analysis were used to test relationships between variables. Other research questions, particularly those that fell within the interviews conducted, were answered with the help of the content analysis approach. "Content analysis in simple terms is the analysis of what is being said, written or recorded (Parveen & Showkat, 2017, p. 2). Content analysis was used in this study because it allowed for the researcher to make inferences within the context of what was said and what was written (Zhang & Wildemuth, 2009).

4.7 Ethical Issues and Considerations

Ethical issues are very essential in research because they guide the researcher on what is sensitive, permissible and what is not (Resnik, 2018). These conditions were mandatory for the researcher to observe. Prior to the collection of data, ethical clearance was first and foremost obtained from the Ethics Committee of the College of Basic and Applied Sciences, University of Ghana with the Ref. No: IESS/AC/13. After this, the ethical issues observed during the data collection process included informed consent, confidentiality of information, privacy and anonymity of respondents.

4.8 Summary

Chapter three discussed issues related with the data gathering aspect of the study. The chapter further examined the research design, population and sampling, and data analysis. It also discussed the instruments and procedures for data collection, and touched on ethical considerations and quality assurance. The next chapter presents the findings of the interviews and the survey as obtained during the field collection of data.

CHAPTER FIVE

RESULTS

5.0 Introduction

This chapter focuses on the presentation of results obtained from the analysis that was carried out. The chapter is divided into six sections based on the objectives of the study. It begins with the personal data of the respondents followed by the presentation of the interview results and from the survey results.

5.1 Demographic characteristics of respondents

Table 5.1 presents the demographic characteristics of the respondents in the study. From the results it is evident that males dominated (102 representing 65.8%) while females were 53 representing 34.2%. Majority of the farmers sampled (68 %) were aged 30 - 39, 48 (%) 40 – 49, 28 (%) 19 – 29 and 11 (%) above 50s. The results showed that the active population of adults below 60 years dominated farming (Table 5.1). In addition, only 5.2% of the respondents had higher education (Tertiary), with majority, (43.9%) without any education. There were however 9.7% who had Junior High school education and another 9.7% had senior high education. Further, it was observed that 83.9% of the respondents were married, 3.9% divorced, 3.9% widowed, and 8.4% single (Table 5.1). This explained why majority (91.6 percent) had children and only 13 (8.4 percent) did not. It was further observed that more than 70% (83.9 percent) of the farmers had farming as their primary occupation, while 16.1% indicated that farming was their secondary occupation.

Table 5.1 Demographic characteristics of farmers in the study area

Variables	Frequency	**Percentage** (%)
	Gender	
Female	53	34.2
Male	102	65.8
	Age	
19 – 29	28	18.1
30 – 39	68	43.9
40 – 49	48	31.0
50 – 59	7	4.5
Over 60 years	4	2.6
	Educational Background	
None	68	43.9
Primary	49	31.6
JHS	15	9.7
SHS	15	9.7
Tertiary	8	5.2
	Marital Status	
Married	130	83.9
Divorced	6	3.9
Widowed	6	3.9
Single	13	8.4
	Number of Children	
None	13	8.4
one – five	120	77.4
six – ten	15	9.7
eleven – fifteen	5	3.2
sixteen – twenty	2	1.3
	Secondary Occupation	
Yes	25	16.1
No	130	83.9
Total	155	100.0

Computed survey data (2022)

Table 5.2 present summary of other or secondary occupation of respondents (23 respondents). These were traders, and the rest were either tailors, plumbers, carpenters, among others. Majority of the respondents 151 (97 percent) operated crop farms and only few 4 (3.0 percent) reared animals. Crops planted were usually cereals, legumes and soybeans. Of the 155 sampled respondents only 15 (9.7 percent) were members of farm associations, 91 (58.7 percent) had received training from NGOs and government extension officers on sustainable farming practices, and just 3 (1.9 percent) had migrated to Chereponi District. This showed that majority of the sampled respondents 152 (98.1 percent) were natives of Chereponi District. Another observation that was made had to do with respondents' years of farming. It was seen that more than 70 percent of the 155 sampled 128 (80.4 percent) were experienced farmers. This was apparent in 82 respondents (52.9 percent), 24 (15.5 percent) and 22 (14.2 percent) respectively indicating that they had been farming for more than 5 years, between 11 to 20 years, and greater than 20 years.

Table 5.2 Other occupation of respondents in the study area

Variables	Frequency	Percent
Other Occupation		
Trader	10	43.0
Tailor	4	17
Teacher	2	9
Mechanic	2	9
Welder	2	9
Plumber	1	4
Carpenter	2	9
Total	23	100
Farm type		
All crops (maize, yam, soybean, rice, groundnut, sorghum, millet, cowpea, cassava)	86	55.0
Cereals and legumes	36	23.0
Soyabeans	29	19.0
Animal husbandry	4	3.0
Membership of Farmer Associations		
Yes	15	9.7
No	140	90.3
Training by NGOs or Government Extension officers about Sustainable Farming Practices		
Yes	91	58.7
No	64	41.3
Number of Years Farming		
less than 5 years	27	17.4
5 to 10 years	82	52.9
11 to 20 years	24	15.5
greater than 20 years	22	14.2
Migration Status		
Yes	3	1.9
No	152	98.1
Total	155	100.0

Computed survey data (2022)

5.2 Knowledge and Perception on Sustainable Farming Practices (SFPs) by Farmers working in the Chereponi District

Table 5.3 showed the knowledge and perception of the respondents on sustainable farming practices. It was evident from the result in Table 5.3 that majority of the respondents had relatively high knowledge/positive perception of sustainable farming practices. This was evident in their responses to the question(s) of whether or not they thought sustainable farming practices increased crop yields, 113 (73.0 percent) (strongly agree), increased farm incomes 110 (71.0 percent) (strongly agree), improved farmer's reputation in the community, 111 (72.0 percent) (strongly agree), and improved the fertility of the soil, 88 (56.8 percent) (strongly agree) respectively.

Table 5.3

Knowledge and Perception on SFPs

Variables		Frequency	Percentage	
SFPs increases crop yields	**Strongly Agree**	113	73.0	Relatively high knowledge/positive perception
	Strongly Disagree	36	23.0	Relatively low knowledge/negative perception
	Neither Agree nor Disagree	6	4.0	
SFPs increases farm incomes	**Strongly Agree**	110	71.0	Relatively high knowledge/positive perception
	Strongly Disagree	34	22.0	Relatively low knowledge/negative perception
	Neither Agree nor Disagree	11	7.0	
SFPs improves farmer's reputation in community	**Strongly Agree**	111	72.0	Relatively high knowledge/positive perception
	Strongly Disagree	27	17.0	Relatively low knowledge/negative perception
	Neither Agree nor Disagree	17	11.0	
SFPs improves fertility of soil	**Strongly Agree**	88	56.8	Relatively high knowledge/positive perception
	Strongly Disagree	37	23.9	Relatively low knowledge/negative perception
	Neither Agree nor Disagree	30	19.3	
Total		155	100.0	

Computed survey data (2022)

5.2.1 Influence of Knowledge and Perception of Farmers on Farmers' Intention to Adopt Sustainable Farming Practices (SFPs)

As per the objectives of this study, the relationship between farmers' knowledge/perception of sustainable farming practices and their intention to adopt sustainable farming practices was examined. Testing the relationship between the selected variables was carried out with the help of the multiple regression analysis. Three latent variables namely 'Attitude,' 'Subjective Norm,' and Perceived behavioural control,' were used as the independent variables to test the effect of farmers' knowledge/perception of sustainable farming practices on their intention to adopt sustainable farming practices. Preliminary analysis however considered testing the selected scales for reliability. This was done using the alpha value of Cronbach.

Table 5.4

Reliability Test of Scale

Overall Cronbach Value = .924	
Variables	Alpha Value if Item Deleted
SFPs increases crop yields	.912
SFPs increases farm incomes	.911
SFPs improves farmer's reputation in community	.912
SFPs improves fertility of soil	.914
SFPs is applied by other farmers on their farms	.916
Practicing SFPs is seen to be a good idea by others	.915
Expectation by most farmers to use SFPs on farm	.925
Be like other farmers when choosing farming practices	.912
Ability to practice at least one of the SFPs	.915
Possess resource to implement SFPs	.926
Possess the knowledge to try out or practice SFPs	.924
Intention to adopt SFPs	.923

Computed survey data (2022)

Table 5.4 showed that the selected scale for the regression analysis was reliable with an overall alpha value of .924 which was greater than the required value of .7. 'Alpha value if item deleted' further revealed that deleting any of the variables in question will not have an impact on the overall alpha value, hence, all the variables were retained.

5.2.2 Results from Regression

Table 5.5 presents the multicollinearity results of the variables used in the regression analysis. With VIF values less than 10 and Tolerance values greater than .10, the absence of multicollinearity in the regression result was established. The examination proceeds to scrutinize the information contained in the Model Summary and ANOVA table.

Table 5.5

Regression Results on Farmers' Intention to Adopt Sustainable Farming Practices

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.216	.188		-1.150	.252		
						P = <.05		
	Attitude							
	SFPs increases crop yields	.596	.111	**.497**	5.367	**.000**	.111	9.001
	SFPs improves farmer's reputation in community	-.243	.112	-.189	-2.176	**.031**	.127	7.881
	SFPs improves fertility of soil	.102	.099	.086	1.027	.306	.136	7.348
	Subjective Norm							
	SFPs is applied by other farmers on their farms	-.242	.114	-.188	-2.126	**.035**	.122	8.183
	Practicing SFPs is seen to be a good idea by others	-.151	.119	-.118	-1.272	.206	.111	9.028
	Expectation by most farmers to use SFPs on farm	.308	.080	**.290**	3.869	**.000**	.169	5.904
	Be like other farmers when choosing farming practices	-.006	.103	-.005	-.058	.954	.146	6.850
	Perceived Behavioural Control							
	Ability to practice at least one of the SFPs	.017	.102	.014	.168	.867	.137	7.286
	Possess resource to implement SFPs	.361	.087	**.294**	4.168	**.000**	.192	5.197
	Possess the knowledge to try out or practice SFPs	.383	.102	**.330**	3.743	**.000**	.123	8.129

a. Dependent Variable: I am planning to adopt SFPs

Computed survey data (2022)

With an Adjusted R Square figure of .853 as seen in Table 5.6, it was revealed that the model explained 85.3% of the variance in farmers' intention to adopt sustainability farming with a statistically significant value of .000. This showed that there was a greater association between the independent variables (knowledge/perception of sustainable farming practices) and the dependent variable (intention to adopt sustainable farming practices). Singular contributions made by each of the observed independent variables in predicting the dependent variable was assessed with the help of Standardized Coefficient Beta values. From Table 5.5 it was observed that farmers' perception about the likelihood to increase crop yields with the practice of sustainable farming practices (.497 Beta p = .000), their perception about whether or not they had the requisite knowledge to practice sustainable farming practices (.330 Beta p = .000), and their perception about whether or not they possessed the resources needed to implement sustainable farming practices (.294 Beta p = .000) had a significant effect on their intentions to adopt sustainable farming practices. Same could be said for farmers' perception about what other farmers in the community expected from them as far as sustainable farming practice was concerned (.290 Beta p = .000). Farmers' perception of sustainable farming practices improving farmers' reputation, although significant (-.189 Beta p = .031), did not show a greater influence on farmers' intention to adopt sustainable farming practices. There was no significant relationship on the other hand between perception of sustainable farming practices improving fertility of the soil (.086 Beta p = .306), perception about the ability to practice at least one of the sustainable farming methods (.014 Beta p = .867) and farmers' intention to adopt sustainable farming practices. The foregone result showed that perceived behavioural control, attitude of

farmers and subjective norms, were all influential on farmers' intention to adopt sustainable farming practices.

Table 5.6

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
1	.929	.863	.853	.668	
ANOVA					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	403.374	10	40.337	90.386	.000
Residual	64.265	144	.446		
Total	467.639	154			

a. **Dependent Variable: Intention to adopt SFPs**

b. **Predictors: (Constant), Possess the knowledge to try out or practice SFPs, Ability to practice at least one of the SFPs, SFPs improves farmer's reputation in community, Practicing SFPs is seen to be a good idea by others, Expectation by most farmers to use SFPs on farm, Possess resource to implement SFPs, SFPs improves fertility of soil, Be like other farmers when choosing farming practices, SFPs is applied by other farmers on their farms, SFPs increases crop yields**

Computed survey data (2022)

5.3 Farming Strategies Used by Farmers

Evidence shown in Table 5.7 revealed 'Gender,' 'Age,' and 'Educational Background' not to be statistically significant to the adoption and practice of conservation farming and organic farming strategies by farmers. The result suggests that deciding to or not to adopt conservation farming and/or organic farming has nothing to do with farmers' gender, age or educational background. This means that both young and old farmers in Chereponi District at any point in time may decide for or against the adoption of conservation farming and/or organic farming, and the same can be said for male or female farmers, educated or non-educated farmers. It is true that farmers who are not educated for instance may not be able to properly comprehend the importance of practicing these sustainable farming strategies and as such may decide against its adoption and

implementation. But that is just one side of the argument: it is also possible that non-educated farmers may be well experienced with lot of years in farming and as such, may be privy to what practices really work or does not work, which may inform their decision to adopt these sustainable farming strategies. That is to say that whatever they lack as a result of no formal education, they can surely make up for with their farming experience. Evidence in the literature is inconclusive on the impact of age on farmers' decision to adopt sustainable farming strategies. Tiamiyu et al. (2009) for example on one hand argues that younger farmers tend to favour the use of modern-day agricultural practices over conservative agriculture, while Simtowe et al. (2016) on the other hand reports that the opposite is rather true. That said, judging by the result, it is possible that both young and old farmers may have other factors such as years of farming and training by NGOs/government extension officers (which have been proven to be statistically significant - see Table 5.8 and Table 5.9) influencing their decision to adopt or not to adopt sustainable farming strategies. Thus, farmers' age is really inconsequential as far as the adoption of sustainable farming strategies is concerned, even more so when other factors can have greater influence on their choices.

Table 5.7

Chi-Square Tests on Farming Strategies used by Farmers

Sustainable Farm Strategies	Variables	Personal Data of Farmers	Chi Square/p-Value (**Yates Continuity Correction**)	
Conservation Farming	little use of hand hoe and hand trowel for soil tillage	Gender Age Educational Background	.338 .079 .099	.561 .779 .753
	Maintenance of organic cover through crop residues and cover crops to minimize erosion loss by wind or water	Gender Age Educational Background	1.100 2.277 .000	.294 .131 1.000
Organic Farming	Use of organic input such as manure, slurry and green compost	Gender Age Educational Background	.052 .000 .099	.819 1.000 .753
	limit the use of artificial fertilizers on farm	Gender Age Educational Background	2.323 1.411 .000	.127 .235 1.000
	Non-use of plant growth regulators (chemicals like auxin, ethylene, and abscisic acid that alter fruit maturity period) to modify plant growth on farm	Gender Age Educational Background	1.104 1.469 .256	.293 .226 .613
	Non-use of antibiotics (drugs that enhance weight gain and/or high number of procreation in animals) on farm	Gender Age Educational Background	.357 .213 .000	.550 .645 1.000
	Engage in mechanical weed control by ploughing, weed pulling, mowing, mulching, etc.	Gender Age Educational Background	1.635 1.096 .000	.201 .295 1.000
	Diversify crop species grown in sequence (i.e. practice crop rotation – e.g. plant beans after planting and harvesting corn)	Gender Age Educational Background	.129 1.374 .000	.719 .241 1.000

Computed survey data (2022)

Table 5.8 revealed 'Number of Children,' and 'Number of Years Farming' to be statistically significant factors in explaining the adoption and practice of conservation farming and organic farming. Under conservation farming and organic farming practices for example, farmers' number of children was statistically significant on farmers' decision not to engage in too much use of hand hoe and hand trowel for soil tillage and their decision to engage in mechanical weed control through weed pulling, ploughing, etc. ($\chi 2 = 30.090$, p value = .000 p/$\chi 2 = 22.515$, p value = .000 p). Farmers' years of farming on the other hand was also statistically significant on farmers' decision not to use plant growth regulators - chemicals like auxin, ethylene, and abscisic acid that alter fruit maturity period, to modify plant growth on their farm and their decision to limit the use of artificial fertilizers on their farms ($\chi 2 = 4.580$, p value = .032 y/$\chi 2 = 7.244$, p value = .007 y).

The decision to not engage in too much use of hand hoe and hand trowel for soil tillage or to practice mechanical weed control is because it requires a large number of labour as the former calls for more hands (labour) to be successfully carried out and the latter usually leads to overgrown weeds and grass on the farm. Farmers with higher number of children are most likely to have enough labour at their disposal to achieve both goals hence their decision to engage in mechanical weed control. The decision not to use plant growth regulators and artificial fertilizers on farms by farmers on the other hand could be due to the great deal of knowledge accumulated by farmers over the years to know exactly what works and what does not work on their farmlands, both in the short term and long term.

Belonging to 'Farm Associations' (see Table 5.8) on the other hand was revealed to be not statistically significant to the practice of both conservation farming and organic farming strategies by farmers.

Marital status was also revealed to be not statistically significant for the practice of all the strategies under conservation farming and organic farming, except for the practice of too much use of hand hoe and hand trowel for soil tillage to control weeds ($\chi 2 = 4.245$, p value = .039). The logical reason for this could be that farmers who are not married are most likely to have relatively lower household sizes which translates into less labour to work on farms. Thus, they are likely to have problems cultivating a piece of land after allowing weeds and other plants to grow on it.

Table 5.8

Chi-Square Tests on Farming Strategies used by Farmers

Sustainable Farm Strategies	Variables	Personal Data of Farmers	Chi Square/p-Value (**Yates Continuity Correction**)	
Conservation Farming	little use of hand hoe and hand trowel for soil tillage	Marital Status	4.245	.039 **y**
		Number of Children	30.090	.000 **p**
		Number of Years Farming	10.229	.001 **y**
		Member of Farm Association	1.178	.278 **y**
	Maintenance of organic cover through crop residues and cover crops to minimize erosion loss by wind or water	Marital Status	.546	.460 **y**
		Number of Children	38.683	.000 **p**
		Number of Years Farming	5.571	.018 **y**
		Member of Farm Association	2.063	.151 **y**
Organic Farming	Use of organic input such as manure, slurry and green compost	Marital Status	2.579	.108 **y**
		Number of Children	21.329	.000 **p**
		Number of Years Farming	13.244	.000 **y**
		Member of Farm Association	2.726	.099 **y**
	limit the use of artificial fertilizers on farm	Marital Status	2.367	.124 **y**
		Number of Children	18.342	.000 **p**
		Number of Years Farming	7.244	.007 **y**
		Member of Farm Association	2.569	.109 **y**
	Non-use of plant growth regulators (chemicals like auxin, ethylene, and abscisic acid that alter fruit maturity period) to modify plant growth on farm	Marital Status	.256	.613 **y**
		Number of Children	30.482	.000 **p**
		Number of Years Farming	4.580	.032 **y**
		Member of Farm Association	2.516	.113 **y**
	Non-use of antibiotics (drugs that enhance weight gain and/or high number of procreation in animals) on farm	Marital Status	.417	.518 **y**
		Number of Children	25.799	.000 **p**
		Number of Years Farming	7.333	.007 **y**
		Member of Farm Association	.350	.554 **y**
	Engage in mechanical weed control by ploughing, weed pulling, mowing, mulching, etc.	Marital Status	.050	.824 **y**
		Number of Children	22.515	.000 **p**
		Number of Years Farming	7.417	.006 **y**
		Member of Farm Association	1.922	.166 **y**
	Diversify crop species grown in sequence (i.e. practice crop rotation – e.g. plant beans after planting and harvesting corn)	Marital Status	.546	.460 **y**
		Number of Children	35.116	.000 **p**
		Number of Years Farming	7.792	.005 **y**
		Member of Farm Association	.780	.377 **y**

Computed survey data (2022)

Table 5.9 also revealed 'Farm Type,' and 'Migration Status' not to be statistically significant on farmers' decision to adopt or implement any of the strategies under conservation farming and organic farming. The result suggests that deciding to or not to adopt conservation farming and/or organic farming has nothing to do with farmers' farm type or migration status. This means that operating a crop farm/animal husbandry or both, or being a native or a migrant is not a critical explanatory factor of farmers' decision to or not to adopt conservation farming and/or organic farming.

For 'Training by NGOs and government extension officers' however (see Table 5.9), a statistical significant result was recorded for all the strategies of conservation farming and organic farming, except for the use of organic manure on farms and the limited use of artificial fertilizers on farms ($\chi2 = 3.646$, p value = .056/$\chi2 = 3.155$, p value = .076). The reason for this could be that even though farmers are trained on the benefits and importance of adopting these strategies, they tend to have reservations on some of the strategies to adopt especially when they consider the short and long term goals. It could be that farmers are interested in achieving high crop yields in the shortest possible time and are convinced that using organic compost compared to the use of artificial fertilizers on their farms, will not help them achieve what they want.

There is also the possibility of the NGOs and extension officers themselves being the brain behind the use of artificial fertilizers on farms by farmers: considering the fact that they are the ones that sometimes supply it to them. NGOs are known for linking farmers to financial institutions to access credit. It is plausible to think that they would want farmers to be able to pay their loans especially if the duration is within a 6-month period or even less. What better way to ensure that farmers are able to fulfill their pledges of paying on time than ensuring that they have the means to expedite crop growth and be able to sell their produce for cash.

Table 5.9

Chi-Square Tests on Farming Strategies used by Farmers

Sustainable Farm Strategies	Variables	Personal Data of Farmers	Chi Square/p-Value (**Yates Continuity Correction**)	
Conservation Farming	little use of hand hoe and hand trowel for soil tillage	Training by NGOs & Gov't Extension officers	5.058	.025
		Farm Type	.993	.319
		Migration Status	.502	.479
	Maintenance of organic cover through crop residues and cover crops to minimize erosion loss by wind or water	Training by NGOs & Gov't Extension officers	12.192	.000
		Farm Type	1.348	.246
		Migration Status	.729	.393
Organic Farming	Use of organic input such as manure, slurry and green compost	Training by NGOs & Gov't Extension officers	3.646	.056
		Farm Type	.993	.319
		Migration Status	.502	.479
	limit the use of artificial fertilizers on farm	Training by NGOs & Gov't Extension officers	3.155	.076
		Farm Type	.947	.330
		Migration Status	.473	.492
	Non-use of plant growth regulators (chemicals like auxin, ethylene, and abscisic acid that alter fruit maturity period) to modify plant growth on farm	Training by NGOs & Gov't Extension officers	6.541	.011
		Farm Type	1.520	.218
		Migration Status	.840	.359
	Non-use of antibiotics (drugs that enhance weight gain and/or high number of procreation in animals) on farm	Training by NGOs & Gov't Extension officers	7.952	.005
		Farm Type	1.641	.200
		Migration Status	.919	.338
	Engage in mechanical weed control by ploughing, weed pulling, mowing, mulching, etc.	Training by NGOs & Gov't Extension officers	4.126	.042
		Farm Type	1.294	.255
		Migration Status	.694	.405
	Diversify crop species grown in sequence (i.e. practice crop rotation – e.g. plant beans after planting and harvesting corn)	Training by NGOs & Gov't Extension officers	12.192	.000
		Farm Type	1.348	.246
		Migration Status	.729	.393

Computed survey data (2022)

5.3.1 Reasons for the Adoption of Sustainable Farming Strategies

Table 5.10 presents the results on the reasons why farmers are likely to or not adopt sustainable farming strategies. For the practice of not engaging in too much use of hand hoe and hand trowel for soil tillage, 63.9 percent of farmers agreed, and 36.1 percent disagreed. This showed that majority of the farmers in this study did not engage in too much mechanical soil tillage.

The main reasons given for this decision were 'advice by NGOs and government extension officers' (100 percent), 'personal choice' (78.4 percent), and advice by other farmers (64.3 percent). On the other hand, for farmers who said no to the practice of adopting too much use of hand hoe and hand trowel for soil tillage, each and every one of them attributed their decision to the 'advice by NGOs and other farmers' (100 percent).

The plausible explanation for this could be that NGOs are known to help farmers acquire credit from banks that could be used to pay for additional labour to assist with soil ploughing and tilling. Thus, it is possible that both NGOs and farmers who have benefited from the use of these credit from banks are likely to advice other farmers against the adoption of little mechanical soil tillage.

For the practice of maintaining organic cover through crop residue to minimize erosion, 59.4 percent of farmers said yes and 40.6 percent said no. 'Personal choice' (78.4 percent) was stated as the main reason for farmers who said yes, whereas 'advice by NGOs' (100 percent) and 'advice by NGOs and other farmers' (100 percent) were also stated as the main reasons for farmers who said no.

It is possible that farmers who decide to adopt such strategies personally want to do so based on their own personal reasons. It is also possible that farmers who decide against such practices may

have had other farmers who have experienced the negative effects with planting cover crops on their farmlands advised them against practicing it.

For NGOs advice as a reason for deciding against the practice of maintaining cover crops on farmlands, farmers in this category may have had other reasons such as the supply of nutrients into the soil other than the prevention of soil erosion for which they would have adopted such a strategy, but were probably convinced by the NGOs that the use of artificial fertilizers would rather be the best choice for achieving such a goal.

None of the reasons outlined in the study proved predictive factors on farmers' decision to use organic manure on their farmlands with a non-statistically significant result ($\chi 2 = 4.946$, p value = .422).

Table 5.10

Chi Square Test on Reasons why Farmers Adopt Sustainable Farming Strategies					
Variables	**Reasons for Adopting SFPs**	**Count**	**Yes**	**No**	**Chi-Square/p-value**
little use of hand hoe and hand trowel for soil tillage	**Advice by NGOs**	% within Reason for adopting SFPs	50.0%	50.0%	$\chi^2 = 17.985$ p value = .003
	Advice by other farmers	% within Reason for adopting SFPs	64.3%	35.7%	
	Personal choice	% within Reason for adopting SFPs	78.4%	21.6%	
	Advice by gov't extension officers	% within Reason for adopting SFPs	55.4%	44.6%	
	Advice by NGOs & Gov't extension officers	% within Reason for adopting SFPs	100.0%	0.0%	
	Advice by NGOs & other farmers	% within Reason for adopting SFPs	0.0%	100.0%	
	Total		**63.9%**	**36.1%**	
Maintenance of organic cover through crop residues and cover crops to minimize erosion loss by wind or water	**Advice by NGOs**	% within Reason for adopting SFPs	0.0%	100.0%	$\chi^2 = 17.481$ p value = .004
	Advice by other farmers	% within Reason for adopting SFPs	60.7%	39.3%	
	Personal choice	% within Reason for adopting SFPs	74.5%	25.5%	
	Advice by gov't extension officers	% within Reason for adopting SFPs	55.4%	44.6%	
	Advice by NGOs & Gov't extension officers	% within Reason for adopting SFPs	25.0%	75.0%	
	Advice by NGOs & other farmers	% within Reason for adopting SFPs	0.0%	100.0%	
	Total		**59.4%**	**40.6%**	
Use of organic input such as manure, slurry and green compost	**Advice by NGOs**	% within Reason for adopting SFPs	50.0%	50.0%	$\chi^2 = 4.946$ p value = .422
	Advice by other farmers	% within Reason for adopting SFPs	64.3%	35.7%	
	Personal choice	% within Reason for adopting SFPs	74.5%	25.5%	
	Advice by gov't extension officers	% within Reason for adopting SFPs	55.4%	44.6%	
	Advice by NGOs & Gov't extension officers	% within Reason for adopting SFPs	75.0%	25.0%	
	Advice by NGOs & other farmers	% within Reason for adopting SFPs	60.0%	40.0%	
	Total		**63.9%**	**36.1%**	

Computed survey data (2022)

Table 5.11 also presents the results on the reasons why farmers are likely to or not adopt sustainable farming strategies. According to the results as seen in Table 5.11, there was no statistically significant result for the adoption of the strategy of 'limiting the use of artificial fertilizers on farms' and the strategy of 'not using antibiotics on farms' ($\chi 2 = 8.584$, p value = .127/ $\chi 2 = 9.552$, p value = .089).

For the practice of not using plant growth regulators however, there was a statistically significant result recorded ($\chi 2 = 11.238$, p value = .047). 57.4 percent of farmers said 'yes' they did not use plant growth regulators on their farms and 42.6 percent said no. 'Personal choice' (68.6 percent) was stated as the main reason for farmers who said yes, whereas 'advice by NGOs and other farmers' (100 percent) were also stated as the main reasons for farmers who said no.

For those who did not use plant growth regulators on the other hand, the reason could be that they themselves have used it before and did not like what they saw, or that they have become aware of its dangers to the soil and the environment at large. There is also the possibility of personal goals and values of the farmer as opined by Milestad et al. (2012) that may not align with the use of plant growth regulators on farmlands. The reason for farming differs for a lot of farmers: not all farmers aim for financial gains, some are very much concerned about what inputs they use on their farmlands and its effect on the environment (Bocqueho et al., 2014). Thus, it is possible that farmers who are more concerned about the sustainability of the environment may decide against the use of chemicals like auxin and ethylene on their farmlands, and this can be solely a personal reason.

It is possible that farmers who use plant regulators on their farms do so because of its benefits in terms of fruit maturity within the shortest possible time. It could be that farmers are interested in achieving high crop yields in the shortest possible time and are convinced that using plant growth regulators on their farms will help them achieve what they want. There is also the possibility of NGOs and extension officers themselves being the brains behind the use of plant growth regulators on farms by farmers. NGOs for instance are known for linking farmers to financial institutions to access credit. It is plausible to think that they would want farmers to be able to pay their loans especially if the duration is within a 6-month period or even less. What better way to ensure that farmers are able to fulfill their pledges of paying on time than ensuring that they have the means to expedite crop growth and sell their produce for cash.

Same can be said about agricultural extension officers who are known to be the first people that farmers rely on for agricultural information. The agricultural extension officer's role includes food security, improved income and poverty alleviation for farmers. Once again, it will not be completely wrong to think that they will themselves advise farmers to use plant growth regulators on their farms with the aim of helping farmers secure enough food, increase their income and possibly mitigate the impact of poverty.

Table 5.11

Chi Square Test on Reasons why Farmers Adopt Sustainable Farming Strategies					
Variables	**Reasons for Adopting SFPs**	**Count**	**Yes**	**No**	**Chi-Square/p-value**
limit the use of artificial fertilizers on farm	**Advice by NGOs**	% within Reason for adopting SFPs	50.0%	50.0%	$\chi^2 = 8.584$ p value = .127
	Advice by other farmers	% within Reason for adopting SFPs	64.3%	35.7%	
	Personal choice	% within Reason for adopting SFPs	74.5%	25.5%	
	Advice by gov't extension officers	% within Reason for adopting SFPs	53.8%	46.2%	
	Advice by NGOs & Gov't extension officers	% within Reason for adopting SFPs	75.0%	25.0%	
	Advice by NGOs & other farmers	% within Reason for adopting SFPs	100.0%	0.0%	
	Total		**64.5%**	**35.5%**	
Non-use of plant growth regulators (chemicals like auxin, ethylene, and abscisic acid that alter fruit maturity period) to modify plant growth on farm	**Advice by NGOs**	% within Reason for adopting SFPs	50.0%	50.0%	$\chi^2 = 11.238$ p value = .047
	Advice by other farmers	% within Reason for adopting SFPs	57.1%	42.9%	
	Personal choice	% within Reason for adopting SFPs	68.6%	31.4%	
	Advice by gov't extension officers	% within Reason for adopting SFPs	55.4%	44.6%	
	Advice by NGOs & Gov't extension officers	% within Reason for adopting SFPs	25.0%	75.0%	
	Advice by NGOs & other farmers	% within Reason for adopting SFPs	0.0%	100%	
	Total		**57.4%**	**42.6%**	
Non-use of antibiotics (drugs that enhance weight gain and/or high number of procreation in animals) on farm	**Advice by NGOs**	% within Reason for adopting SFPs	50.0%	50.0%	$\chi^2 = 9.552$ p value = .089
	Advice by other farmers	% within Reason for adopting SFPs	57.1%	42.9%	
	Personal choice	% within Reason for adopting SFPs	64.7%	35.3%	
	Advice by gov't extension officers	% within Reason for adopting SFPs	55.4%	44.6%	
	Advice by NGOs & Gov't extension officers	% within Reason for adopting SFPs	25.0%	75.0%	
	Advice by NGOs & other farmers	% within Reason for adopting SFPs	0.0%	100.0%	
	Total		**56.1%**	**43.9%**	

Computed survey data (2022)

Table 5.12 further presents the results on the reasons why farmers are likely to or not adopt sustainable farming strategies. According to the results as seen in Table 5.12, there was no statistically significant result for the adoption of the strategy of 'engaging in mechanical weed control ($\chi 2$ = 4.290, p value = .509)'. For the practice of diversifying crop species grown however, there was a statistically significant result recorded ($\chi 2$ = 13.457, p value = .019).

For diversification of crop species grown on farmlands, 59.4 percent of farmers said yes while 40.6 percent said no. 'Personal choice' (72.5 percent) was the main reason why farmers who agreed to the diversification of crop species grown on their farms did so, whereas 'advice by NGOs and other farmers' (100 percent) and 'advice by NGOs and government extension officers' (75 percent) were the main reasons given by farmers who did not practice crop diversification on their farms.

Advice from government extension officers and NGOs were critical factors in farmers' decision not to practice crop diversification. Practicing crop diversification usually takes time and comes with its own cost – in terms of extra hired labour. Extension officers are known for educating farmers on which agricultural strategies and methods to adopt by presenting farmers with all the pros and cons of a strategy so they can make informed choices on what to opt for and what not to choose.

It is possible based on the foregoing logic that farmers may decide against the practice of crop diversification once they know that adopting such strategies may require a tremendous amount of time and extra labour, with additional cost if they are ever going to be successful. That said, it is also important to note that farmers who had chosen to practice crop diversification, constituting 59.4 percent, did so mainly due to their 'personal choice.' Approximately 72.5 percent of those engaging in diversification followed this personal preference, indicating that these farmers made

independent decisions regarding their farming methods. The term 'personal choice' suggests that these farmers understand the advantages of crop diversification. This might include better soil health, less vulnerability to pests and diseases, and a more robust farming system that can handle different environmental challenges. The willingness to diversify may also come from a proactive approach to managing risks, as growing different crops can act as a buffer against market changes and unforeseen farming issues. Unlike farmers who avoid diversification due to issues like time and labour costs, those who chose diversity could be more aware of the long-term benefits and sustainability of diversified farming, realizing that the initial investment of time and labour can lead to positive outcomes in terms of increased productivity, environmental care, and economic resilience.

Table 5.12

Chi Square Test on Reasons why Farmers Adopt Sustainable Farming Strategies					
Variables	**Reasons for Adopting SFPs**	**Count**	**Yes**	**No**	**Chi-Square/p-value**
Engage in mechanical weed control by ploughing, weed pulling, mowing, mulching, etc.	**Advice by NGOs**	% within Reason for adopting SFPs	50.0%	50.0%	$\chi^2 = 4.290$ p value = .509
	Advice by other farmers	% within Reason for adopting SFPs	60.7%	39.3%	
	Personal choice	% within Reason for adopting SFPs	68.6%	31.4%	
	Advice by gov't extension officers	% within Reason for adopting SFPs	55.4%	44.6%	
	Advice by NGOs & Gov't extension officers	% within Reason for adopting SFPs	25.0%	75.0%	
	Advice by NGOs & other farmers	% within Reason for adopting SFPs	60.0%	40.0%	
	Total		**60.0%**	**40.0%**	
Diversify crop species grown in sequence (i.e. practice crop rotation – e.g. plant beans after planting and harvesting corn)	**Advice by NGOs**	% within Reason for adopting SFPs	50.0%	50.0%	$\chi^2 = 13.457$ p value = .019
	Advice by other farmers	% within Reason for adopting SFPs	60.7%	39.3%	
	Personal choice	% within Reason for adopting SFPs	72.5%	27.5%	
	Advice by gov't extension officers	% within Reason for adopting SFPs	55.4%	44.6%	
	Advice by NGOs & Gov't extension officers	% within Reason for adopting SFPs	25.0%	75.0%	
	Advice by NGOs & other farmers	% within Reason for adopting SFPs	0.0%	100.0%	
	Total		**59.4%**	**40.6%**	

Computed survey data (2022)

5.4 Barriers to the Adoption and Implementation of Sustainable Farming Practices

Table 5.13 presents results on the barriers to adopting and implementing sustainable farming practices by farmers living in Chereponi District. According to the results as shown in Table 5.13, it is evident that majority of farmers felt that all the factors outlined in the study played a part in their decision against the adoption of sustainable farming practices. This was seen in their responses to statements like "I think I lack the necessary skills to adopt sustainable farming practice," 86 (55.5 percent) "I think the adoption of sustainable farming practices does not truly benefit the environment ecologically," 102 (66.0 percent) and "I think adopting sustainable farming practices will increase the risk of crop failure on my farm because of the lack of use of pesticides" 101 (65.0 percent) where the majority of farmers indicated that they were in strong agreement with the statements outlined.

That said, it was also clear that out of the eight factors that majority of farmers strongly agreed to have an effect on their decision not to adopt sustainable farming practices, four factors stood out, and two were even more profound. As seen in Figure 2, respondents' perception about sustainability farming practices resulting in immediate cost and reduced crop yields due to the absence of chemical fertilizers, seemed to have hindered them from deciding to adopt sustainable farming practices. This was followed by their perception of an increase in cost due to the lack of support from government and the likelihood to face technical difficulties if they decided to adopt sustainable farming practices. The foregone result showed that 'personal sense of mastery,' 'assessment of expenses and advantages,' and 'perception of risk' all acted as barriers to farmers' decision to adopt sustainable farming practices in the district. A more robust statistical technique however was used in subsequent session to ascertain the predictability of these factors on farmers' decision to adopt sustainability farming practices (see Table 5.15 and Table 5.16).

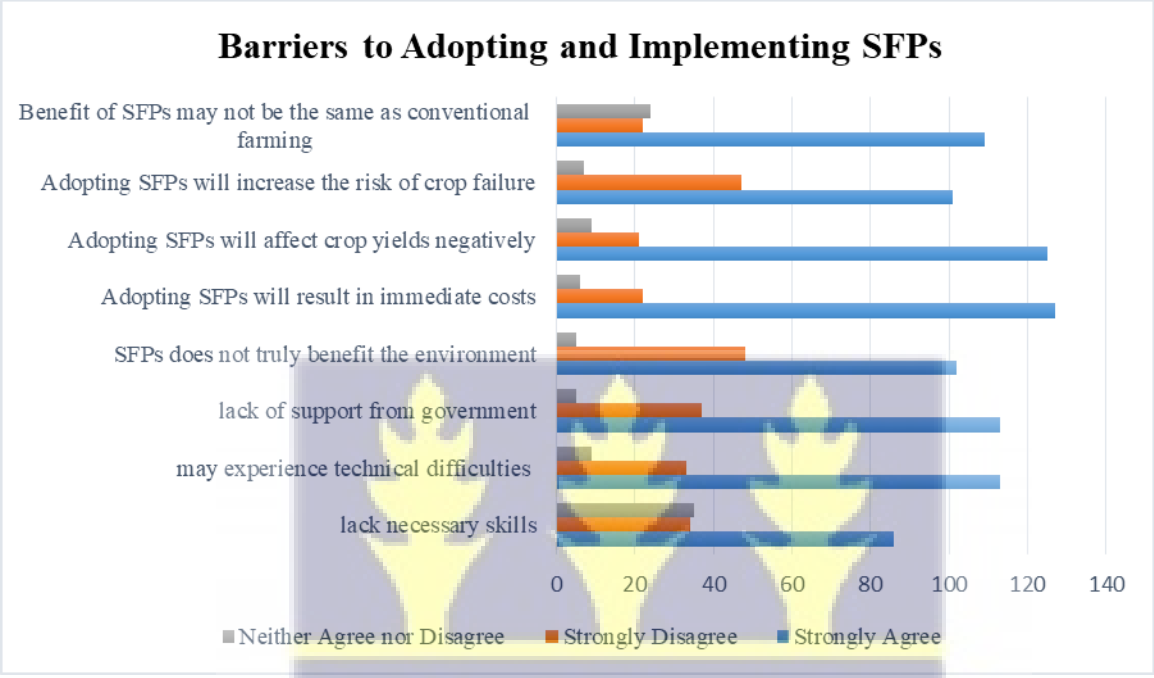
Table 5.13

Barriers to Adopting and Implementing SFPs

Variables		Frequency	Percent
lack of necessary skills to adopt SFPs	**Strongly Agree**	86	55.5
	Strongly Disagree	34	22.0
	Neither Agree nor Disagree	35	22.5
technical difficulties to implement SFPs	**Strongly Agree**	113	73.0
	Strongly Disagree	33	21.0
	Neither Agree nor Disagree	9	6.0
Increased cost for adopting SFPs due to lack of support (extension services, tax reliefs, subsidized technologies) from government	**Strongly Agree**	113	73.0
	Strongly Disagree	37	24.0
	Neither Agree nor Disagree	5	3.0
Adoption of SFPs does not truly benefit the environment ecologically.	**Strongly Agree**	102	66.0
	Strongly Disagree	48	31.0
	Neither Agree nor Disagree	5	3.0
SFPs adoption result in immediate costs (reduced yield in the interim, excess cash into labor, etc.) that exceeds benefits (high yields, higher soil fertility)	**Strongly Agree**	127	82.0
	Strongly Disagree	22	14.0
	Neither Agree nor Disagree	6	4.0
SFPs adoption affect crop yields negatively on farm because of the lack of use of fertilizers	**Strongly Agree**	125	80.0
	Strongly Disagree	21	14.0
	Neither Agree nor Disagree	9	6.0
SFPs adoption increase the risk of crop failure on farm because of the lack of use of pesticides	**Strongly Agree**	101	65.0
	Strongly Disagree	47	30.0
	Neither Agree nor Disagree	7	5.0
benefits for adopting SFPs may not be the same as benefits for adopting conventional farming	**Strongly Agree**	109	70.0
	Strongly Disagree	22	14.0
	Neither Agree nor Disagree	24	16.0
	Total	155	100.0

Computed survey data (2022)

Figure 2



Computed survey data (2022)

5.4.1 Impact of Barriers on Farmers' Decision to Adopt Sustainable Farming Practices

As per the objectives of this study, the impact of some barriers on farmers' decision to adopt sustainable farming practices was examined. Three latent variables namely 'Personal sense of mastery,' 'Assessment of expenses and advantages,' and 'Perception of risk,' were used as the independent variables to test their predictability on farmers' decision to adopt sustainable farming practices in Chereponi District. Testing the relationship between the selected variables was carried out with the help of the multiple regression analytical technique. Preliminary analysis however considered testing the selected scales for reliability. This was done using the alpha value of Cronbach.

Table 5.14 showed that the selected scale for the regression analysis was reliable with an overall alpha value of .912 which was greater than the required value of .7. Alpha value if item deleted

further revealed that deleting any of the variables in question will not have a tremendous impact on the overall alpha value, or worst, may even reduce the overall alpha value. As such, all the variables selected were retained.

Table 5.14

Reliability Test of Scale

Overall Cronbach Value = .912	
Variables	Alpha Value if Item Deleted
lack of necessary skills to adopt SFPs	.892
technical difficulties to implement SFPs	.890
Increased cost for adopting SFPs due to lack of support (extension services, tax reliefs, subsidized technologies) from government	.892
Adoption of SFPs does not truly benefit the environment ecologically.	.906
SFPs adoption result in immediate costs (reduced yield in the interim, excess cash into labor, etc.) that exceeds benefits (high yields, higher soil fertility)	.896
SFPs adoption affect crop yields negatively on farm because of the lack of use of fertilizers	.899
SFPs adoption increase the risk of crop failure on farm because of the lack of use of pesticides	.908
benefits for adopting SFPs may not be the same as benefits for adopting conventional farming	.890
Intention to adopt SFPs	.933

Computed survey data (2022)

5.4.2 Results from Regression

Table 5.15 presents the multicollinearity results of the variables used in the regression analysis. With VIF values less than 10 and Tolerance values greater than .10, the absence of multicollinearity in the regression result was established. The examination proceeds to scrutinize the information contained in the Model Summary and ANOVA table.

Table 5.15

Regression Results on Barriers to the Adoption of Sustainable Farming Practices

Coefficients									
Model			Unstandardized Coefficients		Standardized Coefficients	T	Sig	Collinearity Statistics	
			B	Std. Error	Beta			Tolerance	VIF
1		(Constant)	4.328	.218		19.819	.000		
	Personal Sense of Mastery	lack of necessary skills to adopt SFPs	-.082	.116	-.120	-.712	.478	.155	6.436
		technical difficulties to implement SFPs	.259	.132	**.364**	1.965	**.050**	.128	7.833
	Assessment of Expenses and Advantages	Increased cost for adopting SFPs due to lack of support (extension services, tax reliefs, subsidized technologies) from government	.343	.100	**.512**	3.442	**.001**	.199	5.033
		Adoption of SFPs does not truly benefit the environment ecologically.	-.047	.094	-.081	-.497	.620	.164	6.082
		SFPs adoption result in immediate costs (reduced yield in the interim, excess cash into labor, etc.) that exceeds benefits (high yields, higher soil fertility)	-.253	.115	**-.353**	-2.200	**.029**	.170	5.874
	Perception of Risk	SFPs adoption affect crop yields negatively on farm because of the lack of use of fertilizers	-.161	.122	-.220	-1.322	.188	.159	6.283
		SFPs adoption increase the risk of crop failure on farm because of the lack of use of pesticides	-.239	.095	**-.419**	-2.529	**.013**	.160	6.262
		benefits for adopting SFPs may not be the same as benefits for adopting conventional farming	.207	.118	.276	1.758	.081	.178	5.625

a. Dependent Variable: Intention to adopt SFPs

Computed survey data (2022)

With an Adjusted R Square figure of .324 as seen in Table 5.16, it was revealed that the model explained 32.4% of the variance in farmers' decision not to adopt sustainable farming practices, with a statistically significant value of .000. This showed that there was a relatively low association between the independent variables (personal sense of mastery, assessment of expenses and advantages, perception of risk) and the dependent variable (decision to adopt sustainable farming practices). Singular contributions made by each of the independent variables in predicting the dependent variable was assessed with the help of Standardized Coefficient Beta values. From Table 5.15 it was observed that farmers' perception about the lack of support from government and NGOs in the form of extension services, tax reliefs, subsidized technologies (.512 Beta p = .001), their perception about the adoption of sustainable farming practices likely to increase the risk of crop failure on their farms due to the lack of use of pesticides (-.419 Beta p = .013), and their perception about the likelihood to face technical difficulties if they decided to adopt sustainable farming practices (.364 Beta p = .050) had a greater influence on their decision not to adopt sustainable farming practices. Same could be said for farmers' perception about the adoption of sustainable farming practices likely to result in immediate costs that exceeds benefits (-.353 Beta p = .029).

Other factors like farmers' perception of the non-ecological benefits of adopting sustainable farming practices (-.081 Beta p = .620), perception of the lack of necessary skills to adopt sustainable farming practices (.120 Beta p = .478), and farmers' perception about the likelihood of experiencing low crop yields if they adopt sustainable farming practices (-.220 Beta p = .188) were not so influential in farmers' decision not to adopt sustainable farming practices. All the variables that strongly predicted farmers' decision not to adopt sustainable farming practices in Chereponi District were statistically significant at a p-value of (p = or < .05), and the opposite

was true for variables that did not strongly predict farmers' decision not to adopt sustainable farming practices. The foregone result showed that even though farmers' personal sense of mastery, their assessment of the expenses and advantages, and perception of risk associated with the adoption of sustainable farming practices were all influential to some extent in farmers' decision not to practice sustainable farming, farmers' assessment of the expenses and advantages associated with the adoption of sustainable farming practice was more influential or had a greater impact on farmers' decision not to adopt sustainable farming practices.

Table 5.16

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
1	.599	.359	.324	.798	

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	52.169	8	6.521	10.235	.000
Residual	93.018	146	.637		
Total	145.187	154			

c. Dependent Variable: Intention to adopt SFPs

d. Predictors: (Constant), benefits for adopting SFPs may not be the same as benefits for adopting conventional farming, Adoption of SFPs does not truly benefit the environment ecologically, lack of necessary skills to adopt SFPs, SFPs adoption result in immediate costs (reduced yield in the interim, excess cash into labor, etc.) that exceeds benefits (high yields, higher soil fertility), Increased cost for adopting SFPs due to lack of support (extension services, tax reliefs, subsidized technologies) from government, SFPs adoption affect crop yields negatively on farm because of the lack of use of fertilizers, SFPs adoption increase the risk of crop failure on farm because of the lack of use of pesticides, technical difficulties to implement SFPs

Computed survey data (2022)

5.5 Interview Results

5.5.1 Introduction

The results from the interview that was conducted is presented in this section. Two people were interviewed: an NGO official and a government extension officer. Each of the interview session began with interviewees being briefed about the objectives of the study. This was to ensure that both interviewees were well aware of the reason for which they were being questioned so that the information given by them will be done so voluntarily. Information gathered was then written down and analyzed using the principle of content analysis where inferences are made based on the content of a written document. Both interviewees have been referenced with descriptors as follows: 'NGO Person' and 'Gov't Ext Officer.'

5.5.2 Perception on the Concept of Sustainable Farming and Sustainable Farming Strategies Introduced to Farmers

The interview sessions began with interviewees providing information on their educational level, position, station duty and number of years on the job. The information gathered revealed that both interviewees were specialists in their respective fields with good educational qualifications albeit lacking much experience on the job. The foregoing is based on their comments:

> **NGO Person:** *"My highest educational level is the tertiary level and an HND certificate in Agricultural Engineering. I work as a field enumerator and I've been working for slightly above 2 years now." (Face to face interview, 2022, June).*

> **Gov't Ext Officer:** *"I have completed the university and have an HND certificate in Agric. My position is that of an Agricultural Technician and my station duty is a field enumerator. I have been working for 2 years now." (Face to face interview, 2022, June).*

Interviewees were then asked their general perceptions about sustainable farming and whether or not they thought that it was beneficial to farmers. According to them sustainable farming is a

farming system that aims to increase crop yields of farmers and improve soil fertility through the 'right means'. Both interviewees indicated that they were convinced about the benefits of sustainable farming to farmers with the main reasons being its ability to improve soil suitability and also provide farmers with a blueprint to follow so as to improve their day to day farming activities.

> **NGO Person:** *"Sustainable farming to me is a system that has well laid down procedures and practices and some rules on what to do as a farmer to improve your crop productions, soil fertility and increase your crop yields. I think it is very beneficial because it gives farmers clear view on what to do to improve their day to day farming activities. (Face to face interview, 2022, June).*

> **Gov't Ext Officer:** *"Sustainable farming is a farming practice that aims to improve the fertility of the soil and crop yields of farmers through the right means. I think it is beneficial to farmers because it makes the soil more suitable for planting which is a very good thing." (Face to face interview, 2022, June).*

Biological pests control and application of green organic manure were the two main strategies highlighted by the interviewees when asked to mention some of the sustainable farming strategies introduced to farmers. According to them, even though there were other sustainable farming strategies (i.e. crop rotation) that farmers were introduced to, these two strategies were the main sustainable strategies that they focused on, because these strategies helped to solve some of the most prevalent problems of farmers in the district which was to achieve high crop yields and control pests. The aforementioned is reflected in the following comments:

> **NGO Person:** *"There are a lot of them that we teach them to practice. What I know we do a lot of training on is how to apply organic compost and why it is necessary to use it. That one we practice it a lot. Then we also take them through how to use the cows to control weed growth and pests on the farm. This one too is very important to the farmers because it is an ever present issue that they deal with on a daily basis. The other ones that we do is rotating of crops that they plant on their farm to give nutrients to the soil. Applying organic compost takes the centre stage of*

most of the strategies we introduce to the farmers because it helps the crops grown to flourish and makes it easy for the farmers to get more yields and healthy produce." (Face to face interview, 2022, June).

Gov't Ext Officer: *"One of the main strategy we expose them to is the use of green manure on their farms to increase seed survival rate and improve crop yields." (Face to face interview, 2022, June).*

5.5.3 Collaboration between NGO and Government for the Training of Farmers and Implementation of Sustainable Farming Strategies

In trying to examine how NGOs collaborate with government extension officers for the training of farmers and the implementation of sustainable farming strategies in Chereponi District, both interviewees were asked a series of question. Questions bothered on first, individual contributions made by both parties (i.e. NGO and government) to farmers, and then collaborations between both entities to ensure a successful adoption and implementation of sustainable farming strategies.

First and foremost, interviewees were asked to talk about the ways NGOs and the government help farmers to adopt sustainable farming. According to them, the main form of help given to farmers are usually in the form of education and training – capacity building exercises on the benefits of practicing sustainable farming strategies and the right ways to implement some of the strategies.

NGO Person: *"We help them by educating them and partnering with other stakeholders and institutions to train them on how to go about executing some of the strategies. To convince them to adopt something you need to expose them to what that thing entails and the benefits they stand to gain from that should they decide to adopt it." (Face to face interview, 2022, June).*

Gov't Ext Officer: *"Through capacity building exercises that aims to not only educate them but also to train them on how to implement the strategies well." (Face to face interview, 2022, June).*

The second question was about whether or not NGOs and government extension officers had some form of a module with which farmers were trained and taught how to practice sustainable farming. Interviewees were further asked to talk on how the module works and to elaborate on how it helps them achieve their objective of training farmers to implement sustainable farming strategies. Based on their comments, it was evident that both NGOs and government extension officers operated with the help of a project module. According to them, these modules come with mini-tasks that need to be done by the field enumerator at the time and a timeline for which such tasks ought to be completed. The modules also come with measurable objectives that serve as a metric to assess the performance of the field enumerator in the aftermath of the capacity training exercise and also to measure the progress made by the government or NGO with respect to the specific project embarked on. The aforementioned is buttressed by the following remarks:

> **NGO Person:** *"Yes, definitely. You are supposed to be intentional and deliberate about what you wish to achieve and how you want have to go about it to achieve what you want. So at all times we make sure that there is what we call the project-module that spells out the activities we need to embark on within a specified time period and how we have to go about it: As in, for example, first we educate, then we train, and then we implement with practical exercise. Sometimes the approach is different. A times we can simply do more of the practical as an augmented way of reinforcing an already initiated project or exercise." (Face to face interview, 2022, June).*

> **Gov't Ext Officer:** *"Yes we do. They provide you with the requirements and sometimes even give you the approach to use in training the farmers. For instance, whether to carry out the training in groups or not. You will see the main objective, then under it you have the plan and tasks to carry out. There is also the objective for each task which you will use in your report later on after the entire process. That is what they will use to measure your input and know if you are doing your work well or not." (Face to face interview, 2022, June).*

Interviewees were also asked if farmers they attended to in the district belonged to any form of farm associations established by an NGO or the government, and if yes, to explain the need for farmers to be part of an association. Judging by the comments they both made, there are indeed

farm associations established in Chereponi district but not every association was established by the government or NGO. Some of the associations were already formed by farmers within the community with the aim of helping each other. According to the interviewees, it was essential for farmers to belong to farm associations in order for them to have a stronger voice in policy development and also be able to assist each other in implementing sustainable farming strategies. For NGOs, farm associations made it easier for them to liaise with credit institutions to secure loans for farmers and to convince other important stakeholders to provide farmers with farm inputs and equipment.

> **NGO Person:** *"Yes they do, but the farm associations we have here are not that many and not every one of them was pioneered by us. There are some that were formed by the community members themselves and others were also initiated by government extension officers. As for the reason for belonging to the farm groups – that is what we usually call it here, it is very important to have the influence of a group so that your voices can be heard by the authorities. It also portrays a strong front to other financial institutions about the one-mindedness of farmers to succeed at farming their farmlands and this help us a lot in terms of convincing the institutions about the need to offer farmers credit assistance. On the other hand, it comes in handy a lot when requesting for farm produce for farmers by helping us secure larger quantities for them. It is a win win situation and it is an essential part of our activities." (Face to face interview, 2022, June).*
>
> **Gov't Ext Officer:** *"Yes we have just a few. Some of them they formed it themselves though and then we used that for our exercises. Being a part of a farm association is good because it allows the members of the association to assist and help each other in crop planting and harvest. It is also important because some of the members who are given leadership roles are able to see to it that their followers within the association are on track with the exercises we embark on and the projects we launch. Like how to use some tools, when to administer some of the compost to your soil, etc." (Face to face interview, 2022, June).*

In responding to the question about how government partners and collaborates with NGOs for the training of farmers in the adoption and implementation of sustainable farming strategies, both

interviewees revealed that collaboration between government and NGOs is usually done by one entity providing funds and the other providing officers to train farmers during a project. According to them, the agricultural extension officers who are usually the first point of contact for farmers during a project exercise are often provided by the government, even though a times the NGOs themselves also provide their fair share of extension officers by temporarily recruiting them to aid in a project. Government and NGO partnership also comes in the form of project initiatives that are championed by both entities. This is done through the sending of official letters to the government by NGOs asking for support to execute a project in the district. The following comments supports the foregone:

> **NGO Person:** *"We collaborate to start a project and to carry it out. Sometimes we can think of a project we wish to introduce to support the farmers here and then we get to work, because obviously we cannot do everything by ourselves. So we sometimes send them a letter requesting for their support, especially for officers who can take on the role of project supervisors, field training officers, compost application coaches, etc. Then once we have them on board, we get other stakeholders to support with the funding of the project and taking care of logistics so that we can have a successful exercise. Sometimes it takes a while to finish so you need to plan everything from scratch." (Face to face interview, 2022, June).*

> **Gov't Ext Officer:** *"We join hands together to train the farmers on the right practices to engage in to achieve good crop production. What I know is that the government sometimes brings projects that the NGOs are interested in so they help in whatever way they can – like funding or taking part of the cost and also supporting with officers to do the project." (Face to face interview, 2022, June).*

5.5.4 Barriers to the Adoption of Sustainable Farming Practices by Farmers and Challenges Faced by NGOs and Government Extension Officers when Training Farmers to Adopt Sustainable Farming Practices

Interviewees were asked to talk about the reasons why some farmers in the district decide against the adoption of sustainable farming practices. According to them, the reasons range from

economic factors, personal factors and to institutional factors. Lack of adequate capital to support farm and to pay for labour, slowdown of farm harvest period leading to income problems, delay of work on farm and short land tenure were some of the reasons mentioned by the interviewees. They intimated that the aforementioned factors were the main barriers to the adoption of sustainable farming practices in the district as in almost every farm association present in the district, more than seventy percent of the members are reported to face the same challenges.

> **NGO Person:** *"One of the reason is the absence of enough money to pay for the labour they need and also to manage the farm. Farmers are more accustomed to having things work out with the minimum amount of capital as possible so facing an issue where you require extra funds to manage your farm can be quite daunting for most of them. Let's not forget most of them are peasant farmers and primarily produce to sustain their families as in feed them and only sell a few for cash, so they are not really there financially to be accommodating extra costs. The other reason I would say is the land tenure they are given. Some few people own vast amount of lands and they give these lands out to other people for a fee. The problem is that the tenure given is most often than not inadequate to accommodate the farmer's choice of practicing sustainable farming, because then what it means is that the farmer has to choose between doing the right thing and surviving. And they usually go for the latter. Everything is about protecting their family, feeding them and providing for them. If you ask all of them, most people will tell you what I'm saying. It's a serious problem." (Face to face interview, 2022, June).*

> **Gov't Ext Officer:** *"The main issue they have is with time. Time is a luxury most farmers do not have because of the different climatic conditions we experience here, the speed with which market prices change overtime, and the gradual change in cost of human resource (labour). When you talk to most of them about the reasons why they are not following the practice of sustainability, they will all complain about the same thing – that it slows down their work and prolongs the time of their harvest which makes it difficult for them because they have things they need to pay. You know loans they have taken need to be settled, they have other things to do as well. All these things come to play. This is a shared problem. I know this because when you visit them during meetings, most of them complain about the same things." (Face to face interview, 2022, June).*

When asked about some of the challenges that NGOs and the government face in educating and training farmers to fully adopt and practice sustainable farming, both of the interviewees mentioned transportation and lack of practical materials as the main challenge they faced. They intimated that roads leading to farmers' farmlands tend to be very deplorable and this makes it difficult to transport equipment and other farm inputs to the farmlands. The other issue was that there were not enough equipment or tools that aided in the live demonstration of some of the sustainability farming strategies which hampered their progress.

> **NGO Person:** *"Our main challenge is the nature of the roads here which is not the best. The roads are not in the best of conditions and this makes it a problem transporting stuff to the farm. The other thing too is that we don't have enough farm equipment for our practical's with the farmers." (Face to face interview, 2022, June).*

> **Gov't Ext Officer:** *"The distance you have to cover is something and I believe it's because of the way the roads are if not that like we won't have that challenge. So the road is a serious problem and we have complained about it a lot to the government. It is part of our problem here. We also are short in practical tools to use as demonstrations for our training workshops." (Face to face interview, 2022, June).*

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATION

6.0 Introduction

In this chapter, findings of the study are discussed and the conclusion following logically from the discussions is written down. The limitations of this study are also mentioned and the implications of the study for policy makers as well as some recommendations for future scientific studies are also stated.

6.1 Finding Discussions

Discussion of the major findings of this study was carried out in line with the study objectives. Findings were presented and analysed within the context of empirical literature and theoretical framework established in this study. The purpose was to either corroborate or refute findings of extant literature in the area of sustainable farming practices and stakeholder corroborations.

6.1.1 Level of Knowledge and Perception of Stakeholders on Sustainable Farming Practices

As per the findings from this study, stakeholders showed relatively high knowledge level/positive perception of sustainable farming practices. Majority of farmers answered affirmatively to statements about sustainable farming practices increasing crop yields, farm incomes, and farmers' reputation in the community, as well as improving soil fertility. Other stakeholders (i.e. NGO and government extension officer) interviewed in this study also shared similar opinions on the ability of sustainable farming to increase crop yields of farmers and improve soil fertility.

Findings of the study revealed a significant greater association between the independent variables and the dependent variable with an adjusted R square figure of .853 and a p-value of .000 recorded from the model.

As per the results of the study, perceived behavioural control, attitude of farmers and subjective norms, were all influential on farmers' intention to adopt sustainable farming practices. There was a significant relationship between farmers' perception about the likelihood to achieve an increase in crop yields with the adoption of sustainable farming practices and their intentions to adopt sustainable farming practices. Similar results were also recorded for farmers' perception about whether or not they had the requisite knowledge to adopt sustainable farming practices, their perception about what other farmers in the community expected from them as far as sustainable farming practice was concerned and their perception about whether or not they possessed the resources needed to implement sustainable farming methods. The findings of this study reiterates the conceptual proposition of the Theory of Planned Behaviour which posits that individual's decision to engage in a particular behaviour is primarily driven by their intention, which is in turn affected by three independent psychological constructs namely attitude, norms of society and ease/difficulty of control. The foregoing result refutes the report of Hyland et al. (2018) who argued that only attitude and perceived behavioural control and not subjective norm had a significant effect on farmers' intentions to practice good ways of pasture feeding in Ireland. It corroborates the findings of Rezaei et al. (2018) who argued that farmers' intention to practice sustainable farming is likely to increase if they feel that people whose opinion they value expect them to adopt sustainable farming practices. It also concurs with the findings of Schaak and Mubhoff (2018) who revealed that subjective norms positively influenced farmers' intentions to adopt grazing practices that were ecologically friendly in Germany. There was no

significant relationship on the other hand between perception of sustainable farming practices improving fertility of the soil and farmers' intention to adopt sustainable farming practices. There was also no significant relationship between farmers' perception about the ability to practice at least one of the sustainable farming methods and farmers' intention to adopt sustainable farming practices. It is possible that perceived improvement of soil fertility could not influence farmers' intention to adopt sustainable farming practices because of their individual goals and relative reason for farming (Milestad et al., 2012). According to Milestad et al. (2012), on a farm, it is all about the farmer, and what he or she decides to do. No matter the decision the farmer makes however, it is sure to be controlled by his or her personal goals and values. Following the reasoning and argument of Milestad et al. (2012), it is likely that majority of the farmers in this study were more concerned about enjoying higher crop yields with the adoption of sustainable farming practices than they were with the benefit of having an increase in soil fertility.

6.1.2 Socio-Demographic Factors Influence on Farmers' Decision to Adopt Sustainable Farming Strategies

Findings of the study revealed that there was no significant relationship between the adoption of conservation farming strategies/organic farming strategies and gender, age and Educational Background. The result revealed that deciding to or not to adopt conservation farming and/or organic farming strategies had nothing to do with farmers' gender, age or educational background. Thus, it was clear that at any point in time, both young and old farmers in Chereponi District could decide for or against the adoption of conservation farming and/or organic farming strategies, and the same could be said for male or female farmers, educated or non-educated farmers. The foregoing findings refutes the claims of Zakaria et al. (2020) and that

of Mahama et al. (2020) on the significant relationship between educational background of farmers and the decision to adopt sustainable farming strategies. It also does not corroborate the findings of Djokoto et al. (2016) which showed a significant relationship between the adoption of organic means of growing cocoa and gender. This result was not surprising based on the reasoning that, it was possible for non-educated farmers for instance to decide either to adopt or not adopt conservation farming/organic farming strategies because of their many years of farming which could have made them know what strategies really worked and what did not. Moreover, evidence in the literature was inconclusive on the impact of age on farmers' decision to adopt sustainable farming strategies. Tiamiyu et al. (2009) for example on one hand argued that younger farmers tend to favour the use of modern-day agricultural practices over conservative agriculture, while Simtowe et al. (2016) on the other hand reported that the opposite was rather true.

Furthermore, a statistical significant relationship was found between 'Number of Children' and 'Number of Years Farming' and the adoption of both conservation farming and organic farming strategies. Under conservation farming and organic farming strategies for example, farmers' number of children was statistically significant on farmers' decision to engage in mechanical weed control through weed pulling, ploughing, etc. Farmers' years of farming on the other hand was also statistically significant on farmers' decision not to use plant growth regulators – (chemicals like auxin, ethylene, and abscisic acid that alter fruit maturity period) to modify plant growth on their farm and their decision to limit the use of artificial fertilizers on their farms. The foregoing result does not support the findings of Agula et al. (2018) which showed a significant positive relationship between farmers' years of experience and the use of chemical fertilizer. Higher number of children usually means more labour for work and thus explains the reason for

which a statistically significant relationship was established between 'Number of Children' and farmers' decision to engage in mechanical weed control through weed pulling, ploughing, etc. It is also possible that farmers' decision not to use plant growth regulators and artificial fertilizers on their farms was due to the great deal of knowledge accumulated by farmers over the years to know exactly what worked and what did not work on their farmlands.

There was no statistical significant relationship between 'Farm Associations' and the decision to adopt both conservation farming and organic farming strategies by farmers, except for the practice of biological pest control (i.e. using herbivores to control weeds and pests) that showed a statistically significant relationship. Marital status was also revealed to be not statistically significant for the adoption of all the strategies under conservation farming and organic farming, except for the adoption of limiting mechanical soil tillage and relying on herbivores to control weeds and pests. The reason for the foregoing result could be that farmers who belonged to farm associations had the benefit of calling on other members (especially those who operated both crop farms and animal husbandry) for help by availing their farms as grazing sites for the animals (cows) of these other farmers. A mutually beneficial situation that allowed one party to benefit from weed and pest control on his or her farm, and the other party to achieve the goal of nourished animals was likely to have influenced farmers' decision. The inferred reason for the other result above could also have been that farmers who were not married were most likely to have relatively lower household sizes which translate into less labour to work on farms. Thus, they were likely to have had problems cultivating a piece of land after allowing weeds and other plants to grow on it, or providing men (labour) needed to guide the animals on their grazing expeditions.

'Farm Type' and 'Migration Status' based on findings of the study were not statistically significant on farmers' decision to adopt any of the strategies under conservation farming and organic farming. The implication of the above result was that deciding to, or not to adopt conservation farming and/or organic farming strategies had nothing to do with farmers' farm type or migration status. This showed that operating a crop farm/animal husbandry or both, or being a native or a migrant was not a critical explanatory factor of farmers' decision to, or not to adopt conservation farming and/or organic farming strategies.

A statistically significant relationship was found between 'Training by NGOs/government extension officers' and all the strategies of conservation farming and organic farming except for the use of organic manure on farms and the limited use of artificial fertilizers on farms. The reason for this could be that even though farmers had been trained on the benefits and importance of adopting these strategies, they had reservations on some of the methods to adopt especially when they consider the short and long term goals. It could be that farmers were interested in achieving high crop yields in the shortest possible time and as such were convinced that using organic compost, compared to the use of artificial fertilizers on their farms, could not help them achieve what they wanted. This is in line with the argument of Milestad et al. (2012) who opined that no matter the decision a farmer makes, it is sure to be controlled by his or her personal goals and objectives. According to Milestad and colleagues, sometimes a farmer may react negatively to the power of free-choice and may consequently decide not to engage in the adoption of sustainable farming strategies, especially when faced with uncertainty about cost, feasibility and profitability. There is also the possibility of NGOs and extension officers themselves being the brain behind the use of artificial fertilizers on farms by farmers considering the fact that they were the ones that sometimes supplied it to them as revealed by Asante et al.

(2011). NGOs are known for linking farmers to financial institutions to access credit (Asante et al., 2010). It is therefore plausible to think that they would want farmers to be able to pay their loans especially if the duration was within a 6-month period or even less. What better way to ensure that farmers were able to fulfil their pledges of paying back loans on time than ensuring that they had the means to expedite crop growth and were able to sell their produce for cash.

6.1.3 Reasons for the Adoption of Sustainable Farming Strategies by Farmers

Findings of the study with regards to reasons for the adoption of sustainable farming strategies by farmers were as follows:

For the practice of not engaging in too much mechanical soil tillage, majority of the farmers in this study did not engage in too much mechanical soil tillage. The main reasons given for this decision were 'advice by NGOs and government extension officers,' 'personal choice' and advice by other farmers. On the other hand, for farmers who said no to the adoption of little mechanical soil tillage, each and every one of them attributed their decision to the 'advice by NGOs and other farmers'. The plausible explanation for this could be that NGOs are known to help farmers acquire credit from banks that could be used to pay for additional labour to assist with soil ploughing and tilling. Thus, as opined by Asante et al. (2011), it is possible that both NGOs and farmers who have benefited from the use of these credit from banks are likely to advice other farmers against the adoption of little mechanical soil tillage.

For the practice of maintaining organic cover through crop residue to minimize erosion, 'Personal choice' was stated as the main reason for farmers who said yes, whereas 'advice by NGOs' and 'advice by NGOs and other farmers' were also stated as the main reasons for farmers who said no. Planting cover crops on farms comes with a lot of benefits such as preventing soil

erosion, increasing soil fertility and supplying nitrogen to the soil. That said, it also has its own drawbacks like increasing insects on farmlands, increasing disease in crops planted subsequently, or adding additional cost that comes with hiring labour to plant the seeds. It is therefore plausible to conclude that farmers who decided against the practice of cover cropping on their farmlands did so because of the reports of other farmers who may have experienced the negative effects of cover cropping on their farmlands. The opposite is also true for farmers who decided to adopt such strategy.

For the decision to use organic input such as manure or green compost on farms by farmers however, a non-statistically significant result based on the findings revealed that none of the reasons outlined in the study were found to be predictive factors.

A non-statistically significant result was recorded for farmers' decision to limit the use of artificial fertilizers on their farms and their decision not to use antibiotics on their farms. For the practice of not using plant growth regulators however, there was a statistical significant result recorded. 'Personal choice' was stated as the main reason for farmers who said yes, whereas 'advice by NGOs and other farmers' were also stated as the main reasons for farmers who said no. It is possible that farmers who used plant regulators on their farms did so because of its benefits in terms of fruit maturity within the shortest possible time. It is likely that farmers were interested in achieving high crop yields in the shortest possible time and were convinced that using plant growth regulators on their farms would help them achieve what they wanted. There is also the possibility of NGOs and extension officers themselves being the brains behind the use of plant growth regulators on farms by farmers. NGOs for instance are known for linking farmers to financial institutions to access credit. It is plausible to think that they would want farmers to be able to pay their loans especially if the duration was within a 6-month period or even less. What

better way to ensure that farmers were able to fulfill their pledges of paying on time than ensuring that they had the means to expedite crop growth and sell their produce for cash. Same can be said about agricultural extension officers who are known to be the first people that farmers rely on for agricultural information. The agricultural extension officer's role includes food security, improved income and poverty alleviation for farmers. Once again, it will not be completely wrong to think that they would themselves advise farmers to use plant growth regulators on their farms with the aim of helping farmers secure enough food, increase their income and possibly mitigate the impact of poverty.

For those who did not use plant growth regulators on the other hand, the reason could be that they themselves had used it before and did not like what they saw, or that they had become aware of its dangers to the soil and the environment at large. There is also the possibility of personal goals and values of the farmer as opined by Milestad et al. (2012) that may not align with the use of plant growth regulators on farmlands. The reason for farming differs for a lot of farmers since not all farmers aim for financial gains. Some are very much concerned about what inputs they use on their farmlands and its effect on the environment (Bocqueho et al., 2014). Thus, it is possible that farmers who were more concerned about the sustainability of the environment were the ones who decided against the use of chemicals like auxin and ethylene on their farmlands.

No statistically significant result was recorded for farmers' decision to try as much as possible to engage in mechanical weed control like ploughing, weed pulling, or mulching. For the practices of using biological pest control and diversifying crop species grown however, there was a statistical significant result recorded. Majority of the farmers in the study indicated that they engaged in biological pest control and crop-specie diversification on their farmlands.

'Advice by NGOs and government extension officers,' and 'advice by NGOs and other farmers' according to findings of the study were the main reasons provided by those who said 'yes' they practiced biological pest control on their farms. For those who said no to the use of herbivores on farms as a means of controlling pests biologically, 'advice by government extension officers' was the main reason for that decision. 'Personal choice' on the other hand was the main reason why farmers who agreed to the diversification of crop species grown on their farms did so, whereas 'advice by NGOs and other farmers' and 'advice by NGOs and government extension officers' were the main reasons given by farmers who did not practice crop diversification on their farms. In both scenarios, it was seen that advice from government extension officers and NGOs were critical factors in farmers' decision not to practice any of the above mentioned strategies. Since extension officers are known for educating farmers on which agricultural strategies and methods to adopt: by presenting farmers with all the pros and cons of a strategy to allow them make informed choices on what to opt for and what not to choose, it is possible that farmers decided against the practice of crop diversification or biological pest control once they were informed that adopting such strategies required a tremendous amount of time and extra labour, with additional cost to be successful.

Findings of the study also showed that advice received from NGOs and government extension officers were critical factors in farmers' decision to practice biological pest control on their farms by using herbivores to control weeds and pests. Using pesticides to control pests has a negative effect on the environment and can sometimes damage other crops that were not even targeted by the farmer. There is also the issue of pesticide sprays affecting the health of farmers who use them by causing rashes, nausea and sometimes even blindness or cancer risks. In addition to all of these risk factors, there is also the concern about extra costs that farmers incur with

purchasing these sprays. All of these can be avoided if farmers choose to use biological means rather than chemical pesticide sprays to control pest. Based on the foregoing reasoning, it is likely that farmers who decided to practice biological pest control did so because they had been educated by extension officers and NGOs on all of these risk factors. The foregoing conclusion is based on the report of Azumah et al. (2018) who argued that because extension officers in the agricultural sector are widely regarded by farmers as experts in the area of agricultural practices, they are careful not to give farmers erroneous data on the adoption of a method or strategy so they do not lose their credibility and level of trust among farmers.

6.1.4 Stakeholder Collaboration between NGOs and Government for the Training of Farmers on the Implementation of Sustainable Farming Strategies

As per findings of the study, it was seen that the main form of help given to farmers by both the NGO and government extension officers were usually in the form of education and training – capacity building exercises on the benefits of practicing sustainable farming strategies and the right ways to implement some of the strategies. This result concurs with the findings of Taylor and Bhasme (2018) which opined that agricultural extension services are used as a means to transfer agronomic expertise and knowledge to indigenous farmers. It also substantiates the findings of Avea et al. (2016) who argued that farm owners sometimes acquire training and capacity building assistance from extension officers recruited by NGOs on how to grow and sell their farm produce.

It was further revealed that both NGOs and government extension officers operated with the help of a project module. According to accounts of the interviewees, these modules came with mini-tasks that needed to be completed by the field enumerator at the time and a timeline for which such tasks ought to be done. The modules also came with measurable objectives that served as a

metric to assess the performance of the field enumerator in the aftermath of the capacity training exercise and also to measure the progress made by the government or NGO with respect to the specific project embarked on.

Findings of the study also showed that even though there were some farm associations established in Chereponi district by NGOs and government extension officers, other farm associations formed were created by the local people themselves with the aim of helping one another. As per findings of the study, farm association was revealed as an essential part of the lives of indigenous farmers in Chereponi district as it allowed farmers to have a stronger voice in policy development and be able to assist each other in implementing sustainable farming strategies. Farm associations was also revealed as an integral part of the operations of NGOs in Chereponi district as it made it easier for them to liaise with credit institutions to secure loans for farmers and to convince other important stakeholders to provide farmers with farm inputs and equipment. The foregoing result reaffirms the findings of Avea et al. (2016) which advanced that NGOs and government extension officers are able to work together to enhance the capacity of farmers by training farm group members, assist them to secure credit to procure farm inputs, and help them sharpen their negotiation skills at the marketplace. It also concurs with the reports of Salifu et al. (2012), which revealed that NGOs provide support to farmers in accessing production resources such as seeds, fertilizer, agro-chemicals and machinery either by supplying it themselves as credit or by linking farmers to financial institutions.

It was also revealed according to findings of the study that collaboration between the government and NGOs was usually done by one entity (i.e. NGOs) providing funds and the other providing officers to train farmers during a project. As per the results, even though NGOs focused mainly on securing funds for a project, they sometimes assisted the government by temporarily

recruiting extension service officers to aid in a project. The findings further showed that collaboration between the government and NGOs in the district also came in the form of project initiatives championed by both entities. This was usually done in the form of an official letter addressed to the government by an NGO asking for help in the form of extension officers to carry out a project in the district.

6.1.5 Barriers Influencing Farmers' Decision to Adopt Sustainable Farming Practices

Findings of the study revealed that all the factors outlined in the study did play a part in farmers' decision not to adopt sustainable farming in the district. Out of the eight factors that were identified as barriers to the adoption of sustainable farming practices in the district, four factors stood out, and two were even more profound. The two main barriers to the adoption of sustainable farming practices as per findings of the study were farmers' perception about the possibility that sustainability farming practices may result in immediate cost and reduced crop yields due to the absence of chemical fertilizers, and that it could cause an increase in cost due to the lack of support from government or the likelihood to face technical difficulties. This result reiterates the findings of Michel-Guillou and Moser (2006) which stated that farmers' decision to incorporate sustainable agricultural practices into their everyday activities may be dependent upon their assessment of the possible expenses they may incur and the profits they are likely to gain. It also concurs with the findings of Trujillo Barrera et al. (2016) which revealed that farmers are more likely to adopt sustainable agriculture practices, provided farmers anticipate receiving state assistance such as tax breaks, agricultural extension, and equipment subsidies.

The degree to which the aforementioned factors influenced farmers' decision not to practice sustainable farming was further tested with the help of a multiple regression analytical technique. The predictability of each variable (factor) was tested with the help of Standardized Coefficient

Beta values. According to findings of the study, farmers' perception about the lack of support from government and NGOs in the form of extension services, tax reliefs, and subsidized technologies, their perception about the adoption of sustainable farming practices likely to increase the risk of crop failure on their farms due to the lack of use of pesticides, and their perception about the likelihood to face technical difficulties if they decided to adopt sustainable farming practices had a greater influence on their decision not to adopt sustainable farming practices. Same result was revealed for farmers' perception about the adoption of sustainable farming practices likely to result in immediate costs than benefits. Other factors like farmers' perception of the non-ecological benefits of adopting sustainable farming practices, perception of the lack of necessary skills to adopt sustainable farming practices, and perception about the likelihood of experiencing low crop yields if they adopted sustainable farming practices were not so influential in farmers' decision not to adopt sustainable farming practices. The perception that the benefits for adopting sustainable farming practices may not be the same as the benefits for practicing conventional farming was also found to be non-statistically significant to farmers' decision not to adopt sustainable farming practices. This results first and foremost concurs with the findings of Cohen et al. (2016) which asserted that farmers' assessment of the risk rather than benefits of adopting sustainable farming practices was more influential in their decision against the adoption of sustainable farming practices. It further corroborates the findings of Kuhfuss et al. (2016b) which revealed that farmers who had problems with the use of farm equipment/tools tend to act reluctant towards the adoption of sustainable agricultural activities. The result also authenticates the findings of Bocquého et al. (2014) which revealed that farmers tend to have a challenge deciding to adopt sustainable farming practices due to the inverse relationship between the cost and benefit associated with it.

As per the study findings, all the variables that strongly predicted farmers' decision not to adopt sustainable farming practices in Chereponi District were statistically significant at a p-value less than or equal to .05, while variables that did not strongly predict farmers' decision not to adopt sustainable farming practices were all not statistically significant. The foregoing result revealed that out of the three latent variables namely personal sense of mastery, assessment of expenses and advantages, and perception of risk, farmers' assessment of the expenses and advantages associated with the adoption of sustainable farming practice was more influential or had a greater impact on farmers' decision not to adopt sustainable farming practices.

Findings from the interview on the barriers to the adoption of sustainable farming practices by farmers also revealed that lack of adequate capital to support farm and to pay for labour, slowdown of farm harvest period leading to income problems, delay of work on farm and short land tenure were the main reasons why farmers in Chereponi district decided against the adoption of sustainable farming practices. This result corroborates the findings of Adolwa et al. (2017) which revealed that some farmers refuse to adopt sustainable farming practices because they do not have the means to acquire for example additional labour and not necessarily because they do not subscribe to the ideologies of sustainable farming systems. It concurs with the findings of Nyaga et al. (2015) which intimated that in Kenya, farmers with temporary possession of lands favoured the use of artificial-chemical fertilizers over the practice of mixed cropping in order to produce more. It also gives credence to the findings of Nkomoki et al. (2018) which stated that in Zambia, temporary land tenure and ownership of lands by farmers influenced their adoption of sustainable farming practices.

6.2 Conclusion

This study sought to look at how the various stakeholders (i.e. farmers, NGOs and government extension officers) collaborate and depend on each other to implement sustainable farming practices in Chereponi District. Judging from the findings of this study, it is clear that there is a strong collaboration and partnership between NGOs at Chereponi and the government to train and educate farmers on the need to adopt sustainable farming practices. Collaboration between the two entities come in different shapes and form but mainly through funding and extension service assistance to farmers in the district. As per the results, NGOs focus mainly on securing funds for the farm projects, while the government helps by providing extension officers to help train and educate farmers on how to implement sustainable farming strategies. The findings further showed that collaboration between the government and NGOs in the district also come in the form of project initiatives championed by both entities. This is done in the form of an official letter addressed to the government by an NGO asking for help with project leaders and field enumerators (extension officers) to carry out a project in the district. Establishment of farm associations is seen as another way that NGOs and the government collaborate to help farmers implement sustainable farming practices in the district. NGOs use farm associations to secure loans for farmers and to convince other important stakeholders to provide farmers with farm inputs and equipment, whereas the government advices for the establishment of farm associations to give farmers a stronger voice in policy decisions that affect their day to day activities.

As per the findings, it is clear that farmers indeed depend on the information of NGOs and government extension officers to make decisions about which sustainable farming strategy to adopt and which one to reject. That been said, it is also clear that some of the information

farmers are given by NGOs and government extension officers do not subscribe to the tenets and ideological standpoints of sustainable farming. If farmers are citing advice from NGOs and government extension officers as main reasons why they use antibiotics and plant growth regulators on their farms, then there is indeed a cause for concern. It is plausible to conclude that some personnel of NGOs and the government in the district are only interested in what they may gain from farmers and not concerned about doing what is right for the environment or doing what they have been tasked to do. In any case, both the government and NGOs in the district need to be commended for their use of project modules that not only promote timely execution of projects but also allows for an assessment of the performance of field enumerators in the aftermath of a capacity building exercise for farmers.

6.3 Limitations

1. The sample size of this study makes it difficult to generalize the findings across the population of farmers, NGOs and government extension officers stationed at Chereponi District.

2. Interviewing only one government extension officer and one NGO personnel affects the reliability of the report, for instance, about the barriers to the adoption of sustainable farming practices by farmers in the district since other NGOs and government extension officers may have contrary views from what they said.

3. The study result is also not an equitable representation of the district as only one community was considered in this study. It is likely that farmers in other communities may be faced with different barriers that prevents the adoption of sustainable farming practices. NGOs in those communities as well may also have other way ways by which they collaborate with the government, which may be completely different from what has been captured in this study.

4. Farmers were restricted to specific number of reasons to choose from when asked about the reasons why they adopted sustainable farming strategies. It is likely that other reasons existed that were not captured in this study due to the use of the survey method in collecting data about that question.

6.4 Recommendations

Recommendation for Policy and Practice

1. One of the main barriers to the adoption of sustainable farming practices according to results of this study is the absence of government subsidies. Government should therefore focus on policies that support farmers with subsidized equipment and subsidized farm inputs to increase the number of farmers that adopt sustainable farming practices.

2. Government and NGOs alike must ensure that there are proper measures put in place to monitor the activities of field enumerators and extension officers in the district to be able to achieve the goal of a large scale adoption of sustainable farming practices.

3. Policy makers must come up with policies that encourage banks to give farmers loans with better payment plans and structure in a way to provide farmers with the financial assistance they need to hire additional labour for instance to implement biological pest control and minimal mechanical tilling strategies of sustainable farming.

4. Farmers are encouraged to adopt the practice of rainwater harvesting to preserve water resources efficiently. Rather than letting rainwater run-off and pose risks of erosion or flooding, the implementation of systems, such as tanks or underground reservoirs, can effectively channel the water to storage units. This proactive approach not only diminishes farmers' reliance on conventional water sources, particularly in arid periods but also brings about additional

advantages. By preventing soil erosion, it safeguards the fertility of the soil, leading to enhanced crop yields.

5. Farmers in the district should consider adopting the drip irrigation method, a precise technique delivering water directly to the base of each plant through a network of tubes, pipes, and emitters. In contrast to conventional irrigation methods that might flood entire fields, drip irrigation specifically targets the root zones of plants. By delivering only the necessary amount of water, it minimizes wastage, reducing evaporation and runoff. The controlled and consistent water supply enhances plant growth, potentially resulting in higher yields. This method holds particular importance for farmers in the region, given the prevalent characteristic of erratic rainfall patterns.

Recommendation for Future Studies

1. Future studies should consider using a larger sample size to allow for generalization of results over the population.

2. Future studies should consider interviewing NGOs and government extension officers at different communities in Chereponi district in order to achieve results that equitably represents the study area (i.e. Chereponi district).

3. Future studies should consider using personal interviews when asking about the reasons why farmers decide to adopt certain strategies of sustainable farming. This will allow for a more in-depth revelation on the factors that are crucial to farmers' decision to adopt sustainable farming strategies.

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APPENDICES

APPENDIX I

STAKEHOLDER INVOLVEMENT IN PROMOTING SUSTAINABLE FARMING PRACTICES IN CHEREPONI

Please kindly spend some few minutes to answer the following questions for the study entitled**: Stakeholder Involvement in Promoting Sustainable Farming Practices in Chereponi.** The study is purely voluntary and there are no sanctions for opting out before, during and after the completion of the research instrument. Your identity as a respondent will remain anonymous: at no point will your identity be revealed. All information obtained will be handled with strict confidentiality and no data will be published that can be traced back to the source.

SECTION A – PERSONAL DATA

1. Gender

a. Male [ ] b. Female [ ]

2. Age

_____

3. Educational background

a. None [ ] b. Primary [ ] c. JHS [ ] d. SHS [ ] e. Tertiary [ ]

4. Marital status

a. Married [ ] b. Divorced [ ] c. Widowed [ ]

5. Number of children

_____

6. Do you have any secondary occupation?

a. Yes [ ] b. No [ ]

If yes _____

7. Number of years farming

a. < 5 years [ ] b. 5-10 years [ ]
c. 11-20 years [ ] d. > 20 years [ ]

8. Membership of farmer associations?

a. Yes [ ] b. No [ ]

9. Training by NGOs and/or government extension officers about sustainable farming practices?

a) Yes [ ] b) No [ ]

10. Farm type?

_____

11. Migration status

_____

SECTION B – KNOWLEDGE AND PERCEPTION ABOUT SUSTAINABLE FARMING PRACTICES (SFPs)

12. To what extent do you agree with the following statements? Please indicate on a continuum from 1 to 5 where 1 reflects strongly disagree and 5 for strongly agree

Construct	Items	Description	1	2	3	4	5
Attitude	ATT1	I think SFPs increases my crop yields					
	ATT2	I think SFPs increases farm incomes					
	ATT3	I think SFPs improves a farmer's reputation in community					
	ATT4	I think SFPs improves fertility of my soil					
Subjective norm	SN1	Most farmers important to me apply SFPs on their farms					
	SN2	People important to me would think that using SFPs would be a good idea					
	SN3	Most farmers in my community expect me to use SFPs on my farm					
	SN4	When it comes to choosing farming practices, I want to be like other farmers in my community					
Perceived behavioural control	PBC1	I would be able to practice at least one of the SFPs					
	PBC2	I have the resource to implement SFPs					
	PBC3	I have the knowledge to try out or practice SFPs					
Intention	INT	I am planning to adopt SFPs					

SECTION C – SUSTAINABLE FARMING STRATEGIES USED BY STAKEHOLDERS

13. To what extent do you agree with the following statements? Please indicate on a continuum from 1 to 5 where 1 reflects strongly disagree and 5 for strongly agree

Statement	**1**	**2**	**3**	**4**	**5**
Conservation Farming (Agriculture)					
I try as much as possible not to engage in too much mechanical soil tillage					
I try as much as possible to maintain organic cover through crop residues and cover crops to minimize erosion loss by wind or water					
Organic Farming (Agriculture)					
I try as much as possible to use organic input such as manure, slurry, green compost					
I try as much as possible to limit the use of artificial fertilizers on my farm					
I do not use plant growth regulators (chemicals like auxin, ethylene, and abscisic acid that alter fruit maturity period) to modify plant growth on my farm					
I do not use antibiotics on my farm (the use of drugs to enhance weight gain and/or high number of procreation in animals)					
I try as much as possible to engage in mechanical weed control by ploughing, weed pulling, mowing, mulching, etc.					
I try as much as possible to diversify crop species grown in sequence. (I practice crop rotation – e.g. plant beans after planting and harvesting corn)					

14. What informed your decision to adopt the above mentioned strategies in your farm management system?

a) Advice by NGOs [ ] b) Advice by other farmers [ ] c) Personal choice [ ]

d) Advice by government extension officers [ ]

SECTION D – BARRIERS TO THE ADOPTION OF SUSTAINABLE FARMING PRACTICES (SFPs)

15. To what extent do you agree with the following statements? Please indicate on a continuum from 1 to 5 where 1 reflects strongly disagree and 5 for strongly agree

Statement	**1**	**2**	**3**	**4**	**5**
Perceive Control					
I think I lack the necessary skills to adopt SFPs					
I think I will experience technical difficulties when I try to implement SFPs					
Perceived Costs and Benefits					
I think the lack of support (extension services, tax reliefs, subsidized technologies) from government will increase the cost for adopting SFPs					
I think the adoption of SFPs does not truly benefit the environment ecologically.					
I think adopting SFPs will result in immediate costs (reduced yield in the interim, excess cash into labor, etc.) that exceeds benefits (high yields, higher soil fertility)					
Perceived Risk					
I think adopting SFPs will affect crop yields negatively on my farm because of the lack of use of fertilizers					
I think adopting SFPs will increase the risk of crop failure on my farm because of the lack of use of pesticides					
I think the benefits for adopting SFPs may not be the same as what I experience when I practice conventional farming					
Decision to adopt SFPS					
I have decided to adopt SFPs					

THANK YOU FOR YOUR TIME

STAKEHOLDER INVOLVEMENT IN PROMOTING SUSTAINABLE FARMING PRACTICES IN CHEREPONI

INTERVIEW GUIDE

GOVERNMENT EXTENSION OFFICERS

INTERVIEW QUESTIONS

1. Kindly tell me a little bit about yourself. **(Name/age not included – educational level, position, station duty, number of years on the job)**

2. What is your general perception about the concept of sustainable farming?

3. In your opinion, would you say that sustainable farming practices is beneficial to farmers and why?

4. In what way does the government help farmers in the district as far as the adoption of sustainable farming is concerned?

5. What are some of the sustainable farming strategies introduced to farmers in the district and why?

6. Does the government have like a module by which farmers are trained and taught how to properly practice sustainable farming?

Follow up question: So how is it like? As in, do these modules have timelines for which a programme should have completed and does it include education, training and support in terms of like helping farmers with farm tools, organic manure, subsidies, etc.

7. Do farmers in the district belong to any state institutionalized associations?

Follow up question: So why the need to belong to an association? As in, what is the purpose for farmers associations?

8. How does the government partner and collaborate with NGOs for the training and implementation of sustainable farming strategies among farmers in the district?

9. In your opinion, what do you think are some of the reasons why some farmers in the district decide against the adoption of sustainable farming practices?

10. What about farmers who have been exposed to training concerning sustainable farming practices, are there still challenges with the adoption of sustainable farming practices among them?

11. What are some of the challenges that you face in educating and training farmers to fully adopt and practice sustainable farming?

THANK YOU FOR YOUR TIME

STAKEHOLDER INVOLVEMENT IN PROMOTING SUSTAINABLE FARMING PRACTICES IN CHEREPONI

INTERVIEW GUIDE

NGO's

INTERVIEW QUESTIONS

1. Kindly tell me a little bit about yourself. **(Name/age not included – educational level, position, station duty, number of years on the job)**

2. What is your general perception about the concept of sustainable farming?

3. In your opinion, would you say that sustainable farming practices is beneficial to farmers and why?

4. In what way as an NGO do you help farmers in the district as far as the adoption of sustainable farming is concerned?

5. What are some of the sustainable farming strategies introduced to farmers in the district and why?

6. Do you have like a module by which farmers are trained and taught how to properly practice sustainable farming?

Follow up question: So how is it like? As in, do these modules have timelines for which a programme should have completed and does it include education, training and support in terms of like helping farmers with farm tools, organic manure, subsidies, etc.

7. Do farmers in the district belong to any association established by you (NGO)?

Follow up question: So why the need to belong to an association? As in, what is the purpose for farmers associations?

8. As an NGO how do you collaborate with the government for the training and implementation of sustainable farming strategies among farmers in the district?

9. In your opinion, what do you think are some of the reasons why some farmers in the district decide against the adoption of sustainable farming practices?

10. What about farmers who have been exposed to training concerning sustainable farming practices, are there still challenges with the adoption of sustainable farming practices among them?

11. What are some of the challenges that you face in educating and training farmers to fully adopt and practice sustainable farming?

THANK YOU FOR YOUR TIME